

*Mayor J. P. Bigelow
with the respect of A. H. Hayes*

Catal.

CHLORIDE OF ZINC:

ECONOMIC AND SANITARY RELATIONS;

WITH TESTIMONIALS TO ITS PREVENTING

DECAY, ROT, MILDEW AND COMBUSTION,

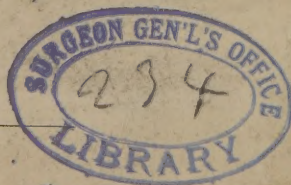
IN

WOOD, CANVAS, CORDAGE, COTTON, WOOLEN, &c.

AND ITS

DEODORIZING AND PURIFYING

FOUL HOLDS, CELLARS, HOSPITAL WARDS, SICK CHAMBERS, SINKS,
CESSPOOLS, VAULTS, CABINET AND CHAMBER VESSELS.



BOSTON:

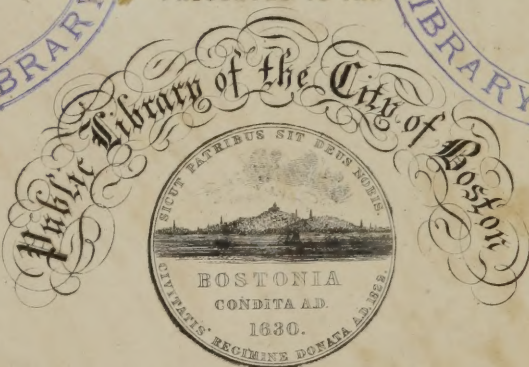
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By Hon. John P. Bigelow.

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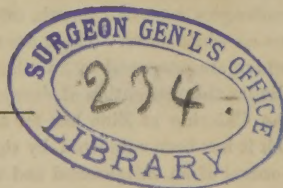
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NOTICE.

THE following pages are selected from the "Reports on the Solution of Chloride of Zinc," printed for her Majesty's stationery office, and other pamphlets published in London in 1847, 1848 and 1849. The pamphlets were issued by the Proprietors of the Patent granted to Sir William Burnett in 1838. The "Reports" have an official authority which attaches to the name of Sir William Burnett, as Director-General of the Medical department of the British Navy.

The testimonials to the efficacy of Chloride of Zinc as an economic agent, come from sources so varied, and so trustworthy, from the positions occupied by the witnesses, that their statements carry with them an authority which would not be increased by any official sanction. Whether we regard Chloride of Zinc as a sanitary, or a conservative agent, preserving the life and health of man, or shielding from decay the works of his hands in wood and textile fabrics, the application of this substance for such purposes has been of the greatest public benefit.

Little, as yet, known in America, the Solution of Chloride of Zinc as a wood preserver, and deodorizer, has received the particular attention of some of the Engineers, Chemists, and Physicians of this country. Their observations and experiments confirm the statements in the "Reports." With the hope that an article so cheap, and so full of beneficial applications, may become speedily and widely known, and extensively used, the following selection has been arranged.

The subject is too deeply interwoven with the general interests of society, to wait for the slow march of cautious, inductive experimentation, to be here repeated.

The economic and sanitary effects have been amply proved in Europe, and under these distinct heads it is intended to offer such testimonials of its results, as may tend to give its use a wider circulation.

It may be added, that its application is perfectly safe both to persons and property. It endangers no one's health, offends no one's senses, soils nobody's fingers, and stains no white dress. These are not minor advantages, but they are advantages all of which are possessed by no other agent which has heretofore been offered to the public for the prevention of decay, and the removal of offensive odors.

The Chloride of Zinc has for a series of years in England stood every test to which it has been subjected by rigid experiment under Government authority, or the ordeal of an enlightened and watchful people.

Convinced of the great utility of the Chloride of Zinc, extensive preparations have been made for its manufacture by the Roxbury Chemical Company, under the direction of Dr. A. A. Hayes, and the Manufacturing Companies at Lowell are erecting expensive apparatus for the purpose of Burnettizing timber.

LOWELL, MARCH, 1850.

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PROSPECTUS.

The following are some of the peculiarities and advantages of Sir William Burnett's Patent process.

ITS EFFECTS ON WOOD.

It hardens and improves its texture. It enters into permanent chemical combination with the ligneous fibre; and does not come to the surface of the wood by efflorescence, like other crystallizable salts; and no amount of washing or boiling in water will remove the chemical compound so formed.

It preserves wood and other articles from the adherence of animal and vegetable parasites, and also from the attacks of insects.

It completely preserves wood from *wet* and *dry* rot.

It renders the wood perfectly unflammable, when used of a certain requisite strength.

ITS EFFECTS ON CANVAS, CORDAGE, COTTON, ETC.

The Preparation preserves these articles from mildew and rot. It renders them more pliable; does not in the slightest degree discolour them; and washing or boiling in water will not remove the combination from their fibres.

ITS EFFECTS ON WOOLEN.

Woolen prepared by this process will be preserved from mildew and rot: it will not be attacked by moths; and washing or boiling will not remove the combination from it.

ITS EFFECTS ON ANIMAL MATTER.

It is used for the preservation of anatomical subjects; and green hides are effectually preserved from decomposition, by being subjected to the process.

ITS EFFECTS ON BILGE-WATER.

It completely neutralizes the offensive effluvia arising from bilge-water on board ships.

ITS EFFECT ON METALS.

Iron or other metals are not oxidated or dissolved, either when immersed in the Solution, or imbedded in wood prepared in it.

CHAPTER I.

TESTIMONIALS

AS TO THE

PRESERVATION OF WOOD FROM DECAY, ETC., ETC.

From S. M. PETO, Esq., M. P.

SIR :

3, Great George-street, Westminster, 8th January, 1849.

In answer to your inquiry respecting some sleepers which were prepared for me by Sir W. Burnett's process, and which were laid down on one of the lines of railways executed by me in the year 1841, I have to acquaint you they are now in as perfectly sound a state as when they were first laid, whilst those that were put down in juxtaposition with them at the same time, unprepared, are quite decayed.

To Lieut. Jackson,

I am, Sir, yours obediently,

Secretary to Burnett's Patent.

(Signed) S. M. PETO.

DEAR SIR :

Warmcell House, near Dorchester, 11th November, 1848.

Will you have the goodness to send me, as early as you can, by the South Western Railway, directed to be left at the Moreton Station, near Dorchester,—a Jar of Sir W. Burnett's Solution for Preserving Timber.

I am happy to tell you that the timber (Scotch fir cut out of my own plantation) which I had soaked five years since and placed in a very trying situation, does not show the slightest symptoms of decay, while some of the same timber, not soaked, used in a comparatively dry place, is evidently decaying fast. I am so satisfied with what I have seen of its property in preserving timber, that I have used nothing else but my own fir in some farm and other buildings which I have been lately erecting, as I am certain it will be quite as durable as the best foreign timber.

I am Sir,

—Jackson, Esq.,

Yours very truly,

Sir W. Burnett's Office for Solution

(Signed)

AUGUSTUS FOSTER.

for Timber, King William street, City, London.

From WILLIAM RAE, Esq., M. D., Deputy Medical Inspector of Hospitals.

Melville Hospital, Chatham,

MY DEAR SIR :

30th October, 1848.

Herewith I send you five specimens of wood, two prepared with the Chloride of Zinc, and three unprepared; all of which have been in my cellar, exposed to destructive dry rot, for nearly four years. The two first you will observe, are of pine, and remain as firm and sound as when placed in the cellar; one of the three last is of pine, and the other two of common fir, all of them being more or less rotten, friable and decayed.

I have been induced to forward these specimens, as forming a strong and convincing proof of the Antiseptic qualities of the Chloride of Zinc, and, in conclusion, may remark that, while fungus grew like wool from the one or unprepared set, it never touched the other.

I remain, my dear Sir,

Your very obedient servant,

To Sir W. Burnett, K. C. H., &c., &c., &c. (Signed) WILLIAM RAE.

Extract of a Letter from Abercromby Dick, Esq., B. C. S., one of the Judges of the Sudder Dewanny Adawlut (Supreme Native Court,) Calcutta, to David Ogilvy, Esq.

April 7th, 1848.

I must now tell you, the specimens of wood, steeped in Burnett's mixture, went yesterday in the 'Labuan,' packed in a box. Captain Alston took charge of them, and will deliver them to my brother William, to whom you had better write about them. They are four pieces, teak, saul, toon and deal, steeped and marked with a B, to denote they have been Burnettized, and four similar pieces marked N, or not Burnettized. They were all placed close to each other, where white ants and damp abounded. Those steeped are all untouched, though the ants have left marks of attempts. Of the others, the two hard woods, teak and saul are a little touched, the toon much more, the deal eaten through and through. In the box are also specimens of country paper, some steeped, some not, and you will readily perceive how good a preservative your Burnett's Patent is. I have washed all my books with it, using a painter's brush, and used it in paste for binding books. To the natives, for records, and to the government, it will be invaluable. I shall make some more experiments on paper, and, when ready with proof, shall propose its use to the government and to the natives.

See Official Report from the Officers of H. M. Dockyard, Portsmouth, p. 23, part II., dated 24th, September, 1847.

As to the preservation of a piece of unprepared wood, upon which prepared canvas had been rolled, after remaining eight years and five months in a damp situation. The canvas and wood were both sound.

But the unprepared canvas and the wood upon which it was rolled were completely rotten.

The Report says,—

"And the sound state of the roller upon which the prepared canvas was rolled, as compared with the other is very remarkable, it having been cut from the same spar."

From Professors BRANDE and COOPER.

SIR:

London, 14th October, 1844.

On examining the specimens of WOOD and canvas which we prepared according to your specification about six months since, and which have remained in damp cellars during the whole of that period, and on comparing them with other specimens which were parts of the same wood and canvas, and which had been similarly exposed without having undergone any previous preparation, we found the specimens of wood not to have suffered any material change,* but as respects the CANVAS, that which had not been submitted to your process was entirely covered with fungus vegetation, while that which had been prepared by immersion in dilute solution of chloride of zinc, in the manner you direct, was not in the slightest degree so affected.

(Signed)

WM. THOS. BRANDE,
JOHN THOS. COOPER.

To Sir W. Burnett, K. C. H.

FURTHER TESTIMONIALS.

SIR:

London, 4th November, 1845.

We have this day again examined the specimens of canvas and WOOD prepared according to the specification of your patent, and which, in the month of April, 1844, we placed in a damp cellar, where they have remained up to this date.

* The period of *six months* being too short for the unprepared wood to become affected.

PRESERVING WOOD.

We are now enabled satisfactorily to corroborate the favorable opinion expressed in our former report. The canvas remains amply protected from all fungus vegetation and rottenness, while a corresponding sample of the same piece which had not been prepared by immersion in the solution is entirely decayed, being mouldy, rotten, black, and in places resembles tinder.

We have also lately compared the strength of a fibre of a piece of canvas which we prepared according to your specification, in October, 1844, with that of the fibre of the same canvas, unprepared, and find that it has in that respect sustained no injury. We are therefore of opinion that your process will not, after any lapse of time, tend to deteriorate the strength of the fibres of the substances in question.

In regard to the several samples of different species of WOOD above adverted to, each of which was cut into two, one half being imbued according to the directions of your specification with the dilute solution of chloride of zinc, while the other half was left in its original condition, we have also to make a favorable report, and to repeat our opinion of the efficacy of your process as a preventive of dry rot, and similar sources of decay; the unprepared specimens are manifesting symptoms of decay and mildew, while those which have been protected by your preparation are clean and sound.

(Signed) WILLIAM THOMAS BRANDE,
JOHN THOMAS COOPER.

To Sir William Burnett, K. C. H., F. R. S., &c. &c.

GENTLEMEN:

London, 30th July, 1846.

In reference to our former statements respecting the efficacy of Sir William Burnett's Patent process for the preservation of TIMBER, Cordage, Sailcloth, and other materials from decay, we beg to repeat that all our subsequent experience has amply justified those statements. We are of opinion that the process, so far from being in any way deteriorating or destructive, is a preservative of vegetable and animal fibre. The specimens of WOOD and of Canvas which we formerly asserted to have resisted the influence of a damp cellar, in which unprepared portions of the same Wood and of the same Canvas became mouldy and rotten, still remain in a sound and protected condition; and as respects the influence of the preservative process upon Canvas laid up in store, we feel entirely justified in concluding from the results of our several experiments, that under such circumstances the protected article will always maintain its superiority in resisting decay, and that it will not itself sustain any injury under influences which would mildew, and impair the quality, strength and texture of unprepared Canvas.

We are, Gentlemen, your faithful servants,
(Signed) WM. THOS. BRANDE,
JOHN THOS. COOPER.

To the Proprietors of Sir W. Burnett's Patent,

Extract from the "Builder" of the 2nd May, 1846,

The preservation of Timber from premature decay is a subject which affects so large a number of our readers, that we are bound to give the widest publicity to every invention that appears likely to effect that object. The various testimonials we have received in favor of Sir W. Burnett's process, and the time that has elapsed since the experiments were first made, lead us to entertain a very favorable opinion as to its efficacy, at all events for a long period of time. The effects ascribed to it are, that it hardens and improves its texture. It enters into permanent chemical combination with the ligneous fibre; and does not come to the surface of the wood by efflorescence, like other crystallizable salts; and no amount of washing or boiling in water will remove the chemical compound so formed. It preserves wood and other articles from the adherence of animal and vegetable parasites, and also from the attacks of insects; and from *wet* and *dry* rot. Further, it renders wood unflammable, when used of a certain strength.

The basis of Sir W. Burnett's process is chloride of zinc, or as it is more commonly called, muriate of zinc, which seems to have a peculiar affinity to woody fibre, entering into intimate union with its component particles, and forming as it were a

new mineralized substance. There is a chemical combination of the metallic base, not merely a mechanical alteration of the position of matter which might be again disunited. There is no decomposition produced, but the fibre of the wood appears to be permanently pervaded by the zinc, and the atoms of which they are formed enter into a new and fixed arrangement.

SIR :

*Metropolitan Wood Paving Company,
Belgrave Works, Thames Bank, 16th May, 1846.*

I am desired by the Secretary to forward to you, three Iron Cramps, taken from a mass of wood Paving Blocks, prepared by Sir W. Burnett's process in 1844, part of the stock of 25,000 yards so prepared. I beg to say that I can see no change in the appearance of the Iron from the solution.

I am, Sir, your obedient servant,

(Signed)

JAMES FOREMAN,

To the Secretary to Sir W. Burnett's Patent.

Surveyor to the Company.

Pitfour, Mintlaw, N. B., October 18th, 1845.

MY DEAR SIR WILLIAM :

Since 1842, your composition for the preservation of timber has been in constant use.

The benefits and advantages derived from it far exceed our expectations.

The great proportion of timber grown here is of the fir tribe. The quality generally soft and spongy.

The composition has given it hardness, durability, and *real value*; and I may mention that, after a trial of nearly three years, palings erected, in many cases on marshy ground, are sound and free from decay.

Palings, so erected, and unprepared, would not have endured many months.

My dear Sir William, your faithful servant,

To Sir Wm. Burnett, K. C. H., &c. &c. &c.

GEO. FERGUSON.

DEAR SIR WILLIAM :

Welton-place, Northamptonshire, October, 1845.

I am happy to send you an account of an experiment with the solution, where it was put to a very severe trial. Some inch boards of elm, sawn up immediately upon being felled, were steeped in the Solution, and used to support the rich earth of a melon and cucumber bed constructed upon what is termed the "Tank System;" being subjected to the action of steam from a tank of hot water beneath, while they supported a body of highly manured earth 2 feet in thickness. Other elm-boards were used in part in the same apparatus. These were of seasoned wood of high quality. On examining the apparatus in the present October, after being seven months in action, the unprepared wood was permeated by the spawn of terrestrial fungi which were growing on the under side; they had also given way in the centre, so much so as to endanger the slate-covered tank beneath. The prepared boards were perfectly *straight*, sound, and unaltered.

I am, dear Sir William, very truly yours,

Sir William Burnett, K. C. H., &c. &c.

RICHARD TREVOR CLARKE.

SIR :

Petworth Park, 28th November, 1845.

In answer to your inquiry as to my opinion of Sir William Burnett's process, I beg to inform you that, after two years' experience, I think so favourably of it, I propose using it on Colonel Wyndham's estate at Petworth more extensively than has been done hitherto.

I find it very useful for preparing oak, sap-rails, English fir, beech, and all timbers that are at all liable to be attacked by the worm.

As the time required for simple immersion in the Patent liquid could not generally be spared, Colonel Wyndham has had a hydraulic apparatus fixed at Petworth, which will enable much larger quantities of timber being prepared; to which he now proposes to add a small steam-engine.

I am, Sir, your humble servant,

To C. JACKSON, Esq.,

Secretary of Sir William Burnett's Patent.

HENRY UPTON.

Royal Hospital, Haslar, 25th February, 1839.

Having had occasion, two years and a half since, to repair the water-closet in the 76th, and some wood-work in the 40th ward of the Royal Naval Hospital at this place, I found in so doing, that the timber was in such a complete state of dry rot, with immense fungi attached, as in many parts to leave the bare paint alone on the face of the wood; which wood had been put up new about five years before. This was replaced by Sir William Burnett's prepared timber, which, on inspection, is now found to be as perfectly sound as it was the day when first fixed, that being, as above stated, two years and a half since.

I discovered, eighteen months ago, many other parts of the building also in a very defective state, and having replaced these defects with wood saturated with Sir William Burnett's preparation, I now find the wood in question to be as sound and perfectly free from dry rot, as when first used.

I am, therefore, of opinion, that timber prepared with Sir William Burnett's solution, will be productive of a very great saving to the Public.

THOMAS BAKER.
Inspector of Works.

FURTHER TESTIMONIAL.

SIR:

Royal Naval Hospital, Haslar, 3rd January, 1843.

I consider it my duty to send you a statement of the woods which we have on trial, of Sir W. Burnett's Patent, at this Hospital. I have this day examined the pieces in the 76th water-closet, which I placed there in December, 1836, and I find them perfectly sound. The old wood which was taken down was in a complete state of dry rot, with immense fungi attached; it had only been up and fixed five years. I fixed some wood of Sir W. Burnett's Patent in the same place, six years ago, and I find it *perfectly sound*. The other pieces of wood that I have placed for trial, have been in so short a time that I cannot give my opinion on them yet. I may state, that in two previous instances, the wood on trial of Sir W. Burnett's Patent (taken down from exposed situations in this Hospital) were *perfectly sound*, whereas the unprepared, which were placed alongside of them, and put up at the same time, and from the same piece of timber, were decayed. I am *still of the same opinion that I expressed four years ago*, that timber prepared with Sir W. Burnett's Patent would be productive of a very great saving to the Public.

I am, Sir, your very obedient humble servant,

THOMAS BAKER.

Inspector of Works.

To the Secretary, &c.

Extract of a Letter from the Earl of Charleville to Sir W. Burnett.

I have been using your Patent Solution extensively, with much satisfaction, and have desired the Clerk of the Works to send your Secretary an account of it.

SIR: *Copy of Report, dated Charleville Forest, Ireland, 12th January, 1843.*

I have been using extensively on the Earl of Charleville's Estate, Sir William Burnett's Patent Solution for the prevention of dry rot, &c., in timber, since June, 1840. All the timber so prepared has a very satisfactory appearance; I consider it quite as good for *seasoning timber*, and *preferable to the solution of corrosive sublimate for timber that is to be worked on the bench*;—it does not leave that gritty substance on the surface that is left from corrosive sublimate, which is so injurious to the plane-irons. I have also had a large quantity of small poles, or tops, prepared principally of Scotch fir, from one and a half to three inches in diameter, consequently they are nearly all sap. They have been in use about two years in what is commonly called, American paling. I find, on examining them, that they are as sound between wind and water, as when put into the ground.

(Signed) R. TONG.

To the Secretary, Burnett's Patent.

Foreman to the Earl of Charleville.

Tullamore, King's County, Ireland, 10th July, 1843.

I certify that I have made use of a large quantity of *domestic timber* (beech, elm, and Scotch fir) in the repairs of my boats, which was prepared in Sir William Burnett's process three years since; most of it I find to be perfectly sound, which would not have been the case had it not been so prepared, as I have had, repeatedly, *Memel timber* decayed in less time, in the same situation.

To the Secretary, Burnett's Patent.

(Signed)

THOS. BERRY.

SIR:

Tullamore, King's County, Ireland, 17th January, 1842.

In reply to your note, I beg to say that from my experience of Sir William Burnett's process of preparing timber, it has succeeded perfectly; and has enabled me to effect a very considerable saving in my establishment, by substituting domestic timber where, heretofore, I used the best foreign.

I am, Sir, yours faithfully,

To the Secretary of Burnett's Patent.

THOMAS BERRY.

Portsmouth, 27th January, 1842.

Lieutenant-Colonel Piper, R. E., in reply to Sir W. Burnett's note of the 24th instant, on the subject of four pieces of plank, which in February 1839 were deposited beneath the floor of one of the shifting-houses at Marchwood; the one of two pieces being of oak, and the other of fir, which had undergone the process of the patent for the prevention of dry rot and mildew; as also two other pieces of plank, the one of oak and the second of fir, all of the same dimensions, which had undergone no process at all; has the pleasure to mention, that in conjunction with Mr. Burgess, the clerk of works, he minutely examined the planks in question when last there, and that they found the two which had received the benefit of the process perfectly sound, but those which had not been subjected to it, in a state fast approaching to dry rot, and smelling offensively, being covered with a yellow powder, and a greasy-mattered paler substance; and they therefore concluded that, in a very short time, the one set of planks would become *useless*; whereas, the other would continue *sound*. And should this description be of any service to Sir W. Burnett's views, Lieutenant-Colonel Piper can only feel pleasure in having afforded it.

The planks were then replaced in their previous place of sepulture for further trial.

DEAR SIR:

Botley, near Southampton, 23rd March, 1842.

The two small frames, with the doors made of Scotch fir of the growth of this neighborhood, which were saturated with Sir Wm. Burnett's patent preparation, although they have been in a very damp cellar nearly two years, there is not the least appearance of mildew, but are as sound in every respect as when first placed there. The beech plank, saturated soon afterwards, although exposed out of doors, has no appearance of decay.

I am, dear Sir, yours truly,

F. W. JERNINGHAM, Esq.

(Signed)

W. E. GUILLAUME.

The testimonial of Capt. C. W. M. S. M'Kerlie, late of the Hon. East India Company's Service, as to the efficacy of the Patent Process in the preservation of the planks of the *Melbourne's* launch, will be found in *Part II.*, page 25.

The following refers to a quantity of "Burnettized" deals put down at the same time with other pieces of the same wood unprepared, in a cellar of a house in Chatham Dockyard (where the flooring had been repeatedly destroyed by dry rot, and where large fungi were then growing,) in the latter part of the year 1838; the prepared and unprepared planks being placed side by side, alternately. When examined, in the spring of 1842, all the unprepared wood had become completely rotten, and was taken up and replaced by other wood; whilst that which was "Burnettized" was perfectly sound and clean, and was *re-laid* with new unprepared wood for further wear.

SIR :

Admiralty, 22nd July, 1842.

I have laid before my Lords Commissioners of the Admiralty, your letter of the 21st instant, and am commanded by their Lordships to acquaint you in reply, that the report of the inspection made at Chatham by Messrs. Fincham and Edye, on some wood prepared according to your Patent, in contrast with unprepared wood placed in the same situation, is FAVORABLE to the preparation invented by you.

I am, Sir, your most humble servant,
(Signed) SIDNEY HERBERT.

SIR WILLIAM BURNETT, K. C. H., &c., &c.

SIR :

Peckham, Surrey, 28th July, 1842.

I have examined several specimens of timber, canvas, and other materials, which, having been prepared by Sir W. Burnett's process, and, together with other specimens of similar materials not so prepared, had been placed in situations which subjected them to the strongest and fairest comparative test; and I hereby certify that the prepared specimens were in a good state of preservation, and that most of the unprepared specimens were more or less in a state of decay.

(Signed) J. NOLLOTH.

Late Master Shipwright of H. M. Dockyard
at Portsmouth.

To the Secretary, Burnett's Patent.

*Important Official Documents respecting the condition of some prepared and unprepared
TIMBER, WHICH HAD BEEN IN THE FUNGUS PIT NEARLY FIVE YEARS.*

SIR :

Admiralty, 26th July, 1841.

I am commanded by my Lords Commissioners of the Admiralty to send herewith for your information a copy of a Report received from the Officers of the Woolwich Yard, on the state of the timber prepared under your Patent, which had been deposited in the fungus pit.

I am, Sir, your most humble servant,

To SIR WM. BURNETT, K. C. H., F. R. S., &c. (Signed) J. PARKER.

SIR :

Woolwich Yard, 15th July, 1841.

Agreeably to your memo. of this day's date, we have to acquaint you, that we have examined the several specimens of timber which have been prepared by Sir William Burnett, and deposited in the fungus pit at this Yard, and find their state to be as follows, viz. :

PREPARED.

ENGLISH OAK.—*Perfectly sound.*ENGLISH ELM.—*Perfectly sound.*DANTZIG FIR.—*Perfectly sound.*

UNPREPARED.

ENGLISH OAK.—*Has a small spot of fungus on the end.*ENGLISH ELM.—*Dooty.*DANTZIG FIR.—*Has fungus on the outside, and is decayed in the heart.*

We are, Sir, your most obedient servants,

O. LANG.

Master Shipwright.

R. ABETHELL.

Assistant to the Master Shipwright.

P. S.—The prepared and unprepared deposited in the pit the 25th August, 1836.

To Capt. SUPERINTENDENT HORNBY, R. N., C. B.

N. B.—Some pieces of prepared and unprepared *canvas* and *calico* were also placed in the fungus pit at the same time, and on its being opened in May, 1838, for the inspection of its contents, the Official Report stated that, as regarded the *canvas* and *calico*, the *experiment was decisive and conclusive*, the prepared being but slightly injured, and in some cases not at all, whilst the *unprepared was entirely destroyed*.

Portsmouth, 8th January, 1839.

In May, 1838, I placed in a cellar (where the dry rot has nearly destroyed the floor) a piece of memel fir, prepared with Sir William Burnett's Solution; also a piece of memel fir without being so prepared, closed the door, and did not open it

again until the latter end of December in the same year. It should here be noticed, that the floor of the cellar is constantly under water. The pieces of timber were placed on a stone shelf about four feet above the water. On examining the timber, the piece not prepared was warped, and its surface covered with blue spots, strongly resembling the appearance of decay on boarded linings against damp walls. The piece prepared with Sir William Burnett's Solution, did not exhibit a similar appearance, but appeared to have resisted the moisture, *which ran off the surface on being removed.*

(Signed)

WILLIAM BURGESS,

Clerk of Works, Royal Engineer Department.

SIR:

Royal Dockyard, Sheerness, 29th April, 1839.

In reply to Sir William Burnett's inquiry relating to some pieces of wood prepared by him, and sent to this Yard to ascertain the effects produced on them when subject for a given period to a sub-marine immersion; and whether during that immersion any effect was produced by the preparation on the iron nails with which they were necessarily secured to the piles under water; I beg to state that it is my decided opinion the preparation on prepared pieces of wood has had no injurious effect on the iron nails by which they were fastened, nor does the preparation appear in any way to hasten the oxydation of the metal. I subjected two pieces of wood at the same time (and of the same kind), one prepared, the other not, and from a careful examination afterwards, I AM DECIDEDLY OF OPINION, THAT THE PREPARATION DOES NOT HASTEN THE OXYDATION OF METAL, AND ON COMPARISON WITH THE UNPREPARED PORTION, APPEARS TO RETARD IT.

THE WOOD WAS TWO YEARS SUBJECTED TO THIS EXPERIMENT.

I am, Sir, your most obedient servant,

J. MITCHELL.

To Dr. WARDEN.

Civil Engineer.

SIR:

August 9th, 1838.

You requested me to put certain specimens of wood in a place I considered most likely to decay them in the shortest period possible. I received six pieces from you, and put them in a close damp place, on the 6th of July, 1836. The prepared pieces were marked with 'W. B.,' twice; the unprepared pieces with the same letters, once. In the place where I put them I had witnessed the fatal effects of the dry rot on some wood I had deposited there in store.

I examined them on the 13th July, 1837, and found all the prepared pieces perfectly sound. The unprepared pieces, with the exception of a piece of fir, showed decided signs of decay by the dry rot.

I replaced them again, to give them a longer trial, and again examined them on the 20th May, 1838, when I found all the prepared pieces perfectly sound.

I also found a piece of fir, unprepared, sound; the other unprepared were oak and elm, which I found thoroughly diseased and rotten on the surface.

It is necessary for me to remark, that the piece of unprepared fir that remained sound, was of that mixed nature with turpentine, that it must take a considerable period to decay it, in the most trying situation.

I beg further to remark, that the piece of prepared oak had a quantity of sap in it, and which I found as sound as when first placed for trial. This I consider most important, as the sap of oak has no durability or strength.

On the 29th December, 1836, I received from you two pieces of canvas, and two pieces of calico and cotton. One of each was prepared, and the other not. I put them in the same place with the wood for trial. On examining them, I found the prepared canvas perfectly sound, and the unprepared very rotten. The prepared calico had a slight mark of decay on it; the unprepared calico was thoroughly rotten, and falling to pieces.

The statements I have made are the mere facts which I witnessed on the trial of the before-stated materials.

Being, sir, rather sceptical in the belief of any certain remedy being found for the prevention of dry rot, I must declare, the trial I have witnessed of the effect of your preparation is such as to leave not the shadow of a doubt but it will have the good effect desired. I am, Sir, your most obedient and humble servant,

Sir William Burnett, K. C. H., &c. &c.

(Signed) JOHN INGRAM.

CHAPTER II.

PROTECTION OF WOOD FROM FIRE.

Chemical Analyses and Experiments on Burnettized Wood.

Copy of a Letter addressed to SIR WILLIAM BURNETT, by order of the LORDS COMMISSIONERS of the ADMIRALTY, respecting the application of his Patent process to the protection of Wood from FIRE.

SIR :

Admiralty, 19th June, 1844.

My Lords Commissioners of the Admiralty having caused experiments to be made to test the incombustibility of woods, when saturated in your solution, I am commanded by their Lordships to acquaint you that it has been ascertained that the soft woods, such as yellow pine and other deals, both foreign and English, saturated in solution prepared in certain proportions, when exposed to the immediate contact of iron heated to a blood-red heat, did not at all ignite into flame, whereas unprepared wood of the same kind, burst into flame immediately.

The same effects however are not produced in the same degree by the same process upon the hard woods.

I am, Sir,

Your most humble servant,

SIR WILLIAM BURNETT, K.C.H.

(Signed) JOHN BARROW.

Additional Testimonial as to the Protection of Wood from Fire.

Communicated by order of the Right Hon. Lord Stanley, Secretary of State for the Colonies, to the Governors of the North American Colonies.

Extracted from the "Bermuda Royal Gazette" of the 21st October, 1845.

"BERMUDA.—The following portions of a despatch recently received by His Excellency, the Governor, we lay before our readers. The specimens of the prepared wood and the Pamphlet alluded to, will be placed, the former in the Museum, and the latter in the Library."—*Ed. Bermuda Royal Gazette.*

(Circular.)

SIR :

Downing street, 30th August, 1845.

The recent calamitous fires at Quebec, have led Her Majesty's Government to consider the propriety of making known in the Colonies, where timber is largely if not entirely employed in the construction of houses, the success which has attended the inventions in this country for the preservation of wood from ignition, as well as from dry rot.

I accordingly inclose for your information a copy of a despatch, with its annexures, which I have this day addressed to the Governor of Canada on the subject. Although the circumstance which has led to that communication has a more direct relation to Canada, it may, to a certain extent, be considered applicable to the other Provinces, and I have to instruct you to adopt such measures as may appear best calculated to effect the object in view.

Governor Reid, &c. &c. &c.

I have, &c.,

(Signed) STANLEY.

MY LORD :

Downing street, 30th August, 1845.

I enclose herewith the copy of a letter from Sir William Burnett, suggesting the importance of employing, in the re-building of those portions of Quebec, which have been destroyed by the late calamitous fires, wood prepared according to his plan.

I also enclose the copy of a letter from the Secretary of the Admiralty, forwarding reports from officers of the dock yard at Portsmouth of the results of experiments made by them to test the efficacy of this invention in preserving timber from ignition, together with a statement from the Secretary of the Patentees, showing the cost per load of preparing wood for purposes of building.

In addition, I inclose the copy of a letter from Mr. Jones, suggesting the applicability of this prepared wood for the formation of roads in the western division of Canada, and proposing that a portion of the sum granted by Parliament for the relief of the sufferers by the fires at Quebec, should be expended in the purchase of the requisite machinery and its conveyance to Canada. This gentleman has lately returned to the province, and would be prepared to afford to your Lordship any explanations which you might require on the subject.

Considering the importance of any measure which has a tendency to diminish the risk of fires in a country in which, as in Canada, wood is extensively used for the construction of dwelling-houses, I think it right to bring these suggestions under your Lordship's notice, in case you should think them proper objects either for expending upon them a part of the sum lately voted by Parliament for the relief of the sufferers by the fires at Quebec, or for making them the subject of an application to the Provincial Parliament.

I have, &c. &c.

(Signed) STANLEY.

To the Right Hon. Lord Metcalfe, &c. &c.

SIR :

Admiralty, 14th August, 1845.

In reply to your letter of the 9th instant, with its inclosure from Sir William Burnett, I am commanded by my Lords Commissioners of the Admiralty to transmit to you, for the information of Lord Stanley, a copy of a Report from the officers of Portsmouth Yard, upon the effects of his Solution applied to the purpose of preventing ignition in timber, or rather to prevent it breaking into flames. In consequence of that report, my lords have ordered the bulkheads in the holds and magazines in Her Majesty's ships to be fitted with timber so saturated, and it is also applied largely to the various buildings in Her Majesty's dock yards.

I send for Lord Stanley's further information, a copy of a statement of the price per load of preparing timber for building purposes.

I am, &c.,

(Signed) W. A. B. HAMILTON.

Geo. Wm. Hope, Esq., &c. &c.,

Secretary,

SIR :

Portsmouth Yard, 13th March, 1844.

With reference to your directions of the 1st ultimo, to make experiments as to the degrees of prevention against ignition into flame, which timber saturated with Sir William Burnett's Solution, affords comparatively with wood of the same kind and unprepared, we have the honor to state, that we have very carefully instituted a series of experiments on this subject, of which the following are the results.

[A portion of the experiments were made by placing the prepared and unprepared specimens in one of the furnaces of the metal mills, in which the results were decidedly in favor of the prepared woods; which resisted that intense heat much longer than the unprepared. The experiments were then continued as follows.]

Red Pine (Canada), the red hot iron placed over both — the unprepared burst into flame immediately—the prepared gave no symptoms of flame, and the iron became cold without its inflaming.

Elm (Canada) placed in hot pots containing the copper cakes lately ladled out of the refining furnace. The unprepared ignited into flame in half a minute. The prepared into a very much smaller flame in two minutes and a quarter.

Yellow Pine (Canada) placed in the cake pots similarly to the beforementioned. The unprepared burst into flame immediately. The prepared was watched for twelve minutes, but burst not into flame at all. The heat was very great.

A second experiment was tried on this timber by placing red hot iron on it. The unprepared ignited immediately into flame. The prepared not at all,

It appears from the above experiments, that some of the prepared woods (especially the Canada Yellow Pine) have resisted ignition into flame to an extraordinary degree.

We are of opinion that Yellow Pine Timber prepared in this way might be used most beneficially, not only for magazines and light room bulkheads, but also for all the bulkheads of a ship. There appears to be nothing in the Solution calculated to injuriously affect the health of the crew, and if, by preparing Yellow Pine Timber in this way, it might be made as durable as the timber generally used for bulkheads, it would be found to possess the double advantage of preserving the timber and preventing its ignition into flame. The Solution used in the above experiments was about eight times the ordinary strength.

We remain, &c.,
(Signed) R. BLAKE. J. WATTS.
F. STURDIE. J. OWEN.

SIR :

Portsmouth Yard, 25th May, 1845.

With reference to your memo. 20th March last, directing me to report whether we propose that bulkheads should be prepared with Sir William Burnett's Solution of the same strength as that used in the experiments described in our letter of the 16th March last, that is, eight times the usual strength, and if so, what would be the expense of fitting a line-of-battle ship in that manner.

The following is the comparative expense of fitting the bulkheads of the hold of a line-of battle ship with ordinary timber unprepared, and with Yellow Pine and Riga Fir prepared with Solution of one pound of Chloride, to two gallons of water.

Bulkheads &c. in hold, of English oak, 3 in. thick, 2,760 cubic feet	£	s.	d.
	966	0	0
Do., Yellow Pine, 3 in. thick, 2,760 cubic feet, including cost of preparation	577	18	0
Difference in favor of Yellow Pine	£388	2	0
Bulkheads &c. in hold, of Riga Fir, 3 in. thick—2,760 cubic feet, including cost of preparation	646	18	0
Difference in favor of Riga Fir	£319	2	0

We have, &c., &c.,
(Signed) R. BLAKE. J. WATTS. J. OWEN.

Chemical Analyses of and Experiments on various specimens of Burnettized Timber.

From THOMAS GRAHAM, Esq., M. A., F. R. S., L. and E., Professor of Chemistry, University College, London.

After making several experiments on wood prepared by the Solution of chloride of zinc for the purpose of preservation, and given the subject my best consideration, I have come to the following conclusions :

The wood appears to be fully and deeply penetrated by the metallic salt : I have found it in the centre of a large prepared paving block.

The salt, although very soluble, does not leave the wood easily when exposed to the weather, or buried in dry or damp earth. It does not come to the surface of the wood by efflorescence, like the crystallizable salts. I have no doubt, indeed, that the greater part of the salt will remain in the wood for years, when employed for railway sleepers or such purposes. This may be of material consequence when the wood is exposed to the attacks of insects, such as the white ant in India, which I believe would be repelled by the poisonous metallic salt.

After being long macerated in cold water, or even boiled in water, thin chips of the prepared wood retain a sensible quantity of the oxide of zinc; which I confirmed by Mr. Toplis's test, and observing that the wood can be permanently dyed from being charged with a metallic mordant.

I have no doubt, from repeated observations made during several years, of the valuable preservative qualities of the Solution of chloride of zinc, as applied in Sir W. Burnett's process; and would refer its beneficial action chiefly to the small quantity of the metallic salt which is permanently retained by the ligneous fibre in all circumstances of exposure. The oxide of zinc appears to alter and harden the fibre of wood, and destroy the solubility, and prevent the tendency to decomposition of the azotised principles it contains, by entering into chemical combination with them.

(Signed)

THOMAS GRAHAM.

University College, 25th Oct. 1845.

EXTRACT from "ILLUSTRATIONS OF THE THEORY AND PRACTICE OF VENTILATION, &c., &c." By D. B. REID, M.D., F.R.S.E., late Vice President of the Society of arts for Scotland, and Senior President of the Royal Medical Society, Edinburgh. (Pages 73, 74; subject, DRY ROT.)

In all cases where there is either peculiar exposure, a difficulty in obtaining constant and free access to timbers, or a desire to give the highest protection, the materials should be subjected to those agents whose antiseptic powers tend to oppose all incipient vegetation. Among these the muriate of zinc, introduced by Sir WILLIAM BURNETT, which I have used on different occasions, and which from the specimens I have seen is the most powerful of those materials that DO NOT AFFECT THE TEXTURE OR OTHER QUALITIES OF THE WOOD.

Many oily antiseptics, though offensive from their odor, are also effectual in preventing Dry Rot; but, as yet, I have not seen any specimens of wood or canvas that have resisted such trying circumstances as those that were protected by the muriate of zinc.

Experiments made by Mr. Glass, chemist to the Proprietors of Sir W. Burnett's Patent, to ascertain whether or not, the Solution of chloride of zinc had penetrated to the centre of a log of oak, 14 feet long by 18 inches in diameter, prepared in the hydraulic apparatus in daily use at the Station, Millwall, Poplar.

1. The log was divided into two pieces by a saw.
2. A quantity of wood was then removed by an auger from the centre of one of the ends of the newly cut pieces.
3. The portion of wood removed by the auger, dried and slowly charred in a porcelain crucible.
4. The charred wood digested in hot nitro-hydrochloric acid, and the Solution obtained filtered.
5. The clear filtrate supersaturated by ammonia; succinate of ammonia then added, and the liquid boiled and filtered.
6. To the clear filtrate was added hydro-sulphate of ammonia. This produced a white precipitate which is characteristic of a zinc salt, and proved that the Solution had been forced to the centre of the log of oak.

Experiments intended to prove that chloride of zinc produces with wood a compound insoluble in water.

- A. Some white pine wood was cut out into thin slips about the size of matches, and one half digested in a Solution of chloride of zinc for four hours, and then carefully dried.
 - a. The unprepared wood dyed in a boiling infusion of logwood (*Hæmatoxylon Campechianum*). The color obtained was a reddish yellow.

- b. The one half of the wood so dyed was boiled in water. The coloring matter was nearly all removed,—the color left being yellow.
 - c. The prepared wood was dyed as in a. A dark reddish brown color was produced.
 - d. A portion of the prepared wood so dyed was boiled in water. The excess of coloring matter was removed, yet the same shade of color was left as in c.
 - e. Another portion of the prepared wood was boiled in water, and then dyed as above. The same color was produced as in c.
 - f. Another portion of the prepared wood treated as in e, was boiled in water. The same color as in c, was left on the wood.
 - B. 1000 grains of the interior of a Burnettized beech rail used for some time on Prosser's Experimental Railway at Wimbledon Common, cut into very thin pieces, yielded 7 grains of oxide of zinc, of which only $2\frac{1}{2}$ grains could be dissolved by boiling water. This small proportion (being an excess of chloride of zinc) had not combined with the wood, and therefore was soluble in water.
- 3rd October, 1845.

EXTRACTS FROM A REPORT OF AN OFFICER OF ENGINEERS,

Commissioned by the French Government to examine and report upon the merits of
 SIR WILLIAM BURNETT'S PATENT PROCESS.

Report upon the process employed in England for the preservation of Wood, Canvas, and Cordage.

Many researches have been made until now, more particularly within the last few years, to find a process which will preserve woods from the rapid decay to which they are subject in the universal uses to which they are employed.

Amongst the numerous means that have been submitted to the public, there are three worthy of being cited, which appear to have some chances of success.

[The writer then gives a brief account of other methods adopted for the same purpose, with objections to them, and proceeds:]

The process of which I have to give an account, is that of Sir William Burnett, Director-General of the Service of health in the English Navy, which has been proved by many years' experience; and if it does not resolve the problem completely, it has at least, above all the others, some positive advantages, which render it worthy of attention.

This process consists in introducing into the wood, by means of great pressure, a solution of chloride of zinc, and in replacing as much as possible the sap by this solution. * * *

I have seen some slender plank and some pieces of canvas, which, after having been submitted to the preparation, had been placed during many months upon the soil of a very damp pit, by the side of others of the same dimensions obtained from the same plank, and some other pieces of canvas cut from the same piece, which had not been prepared. The first was perfectly sound; the second showed evident traces of deterioration—some parts were even completely rotten.

The intimate contact of a rotten piece has not any effect upon the prepared piece, as has been proved to me by the result of an experiment made to this effect, by the principal surgeon of the arsenal at Portsmouth.

The solution of chloride of zinc possesses two other important properties:—1st, it renders the wood very difficult to inflame; and, 2d, if in a wooden vessel it be mixed with the water of the hold, (bilgewater,) it preserves it for a long time from corruption, and it also prevents the disagreeable smell, which is one of the plagues of mariners. This last property has been profitably used on board the royal yacht "Victoria and Albert;" and I saw at Southampton the packet-boat "Oriental," of 450 horse power, on board of which this process has been used with success. As to the first property, it is not less precious; and many great misfortunes may be avoided by using it in the construction of roofs, sheds, &c.

To give an account of the action of chloride of zinc upon wood—the action to which its preservative effect is due—I have, myself made an experiment, of which here is the summary.

Some small pieces of prepared pine wood and some others of the same kind unprepared, were plunged separately into a decoction of logwood, and boiled during a quarter of an hour; after which they were taken out and washed.

The color had scarcely taken upon the unprepared wood; that, on the contrary, which had been impregnated with chloride of zinc had taken a very deep red-brown color.

Some pieces of wood like the preceding, after having been dyed and washed in the same manner, were plunged during a quarter of an hour in boiling water. The color of the unprepared wood was almost entirely removed—that of the prepared was scarcely changed. In fine, some small pieces of prepared wood, in all respects like those referred to in the preceding experiments, have been first washed, then plunged into boiling water, in which they were kept during a quarter of an hour, after which they were dyed as before, and then washed in boiling water. Nevertheless the color remained the same as if all these washings had not been given to them.

It appears right to conclude from these facts that the chloride of zinc combines chemically with the ligneous matter of the wood, and that, although this salt is soluble in water to an enormous degree, the compound which it forms with the wood is perfectly insoluble, even in boiling water.

There is, then, no reason to fear that a piece of wood or a sail once prepared will lose, by a long continuance in water, the qualities that have been communicated to them by the preservative salt; and it may be conceived that the ligneous matter, having changed its nature, becomes capable of resisting the causes of destruction which it had not the power of resisting before.

As to the expenses that would be occasioned by the use of Sir William Burnett's process, they are of little consequence if we consider the saving that would result to the Navy by the use of an efficacious process of preservation; and there is no good in being prejudiced against it.

[After some details as to the cost of the process and a description of the apparatus used for the purpose in the Government dock yards in England, and the Works of the Proprietors of the Patent at Milwall, Popular, he adds:]

An interesting question which presents itself here, is to know in what state the wood ought to be submitted to the preparation. Ought it to be green or perfectly dry?

In my opinion the wood, to be submitted to an efficacious preparation, ought to be that recently cut; for then all its pores are open and the sap is more easily drawn from it and replaced by another fluid; a very dry wood, of which the pores are so close that, in a manner, they disappear, would offer great difficulties to such a preparation; and there are other hard woods with which it would be impossible.

The wood employed then, ought to be recently cut; besides it ought to be reduced to its smallest dimensions. This is economical, for the cube of it is considerably reduced; moreover, one is much more sure of completely saturating the pieces of which the square is become much less.

I saw in a store at Chatham, the members of a frigate intended soon to be put upon the stocks. These members, after being prepared by Sir William Burnett's process had been deposited under a shed for six months for the purpose of drying before being used.

This time, it appears, is sufficient to prevent any inconvenience in employing prepared wood; as it dries so well that the ordinary working (*i.e.* planing down) is sufficient when they come to set up the vessel with crooked timbers.

As to the cordage, their thickness being comparatively small they can be prepared a long time before they will be wanted for the storehouse.

In case it should be ascertained that with the precautions prescribed by the English Admiralty, they succeed in completely saturating wood of large dimensions, it would become interesting to apply the process for the preservation of wood for masts; and, in that case, to avoid a useless expense, it would be expedient, at first to carry the dimensions of the cylinder to what it ought to be for the reception of

the largest piece of wood used for a mast. At Chatham, at the time when I visited that arsenal, the establishment of another cylinder 95 English feet long was in contemplation for this purpose.

I will conclude by stating concisely the principal results to be drawn from the preceding considerations.

The process of Sir William Burnett is really efficacious for the preservation of wood, canvas, &c., when they can be saturated completely with the preservative liquid.

The process is easily employed when once the necessary apparatus is established; and it is attended with an insignificant expense, if we compare the figure with that which represents the value of the wood employed.

The example given by the English Admiralty is a powerful argument in favor of the adoption of this process; if not in a general manner, at least for wood of moderate and small dimensions.

(Signed)

A. M. MANGIN,

Ingenieur de la Marine.

November, 1845.

CHAPTER III.

TESTIMONIALS

AS TO THE

PROTECTION OF CANVAS, CORDAGE, COTTON, &c.
FROM DECAY AND MILDEW, AND WOOLEN FROM
MOTHS.

REPORT by Professors BRANDE and COOPER.

London, 24th May, 1844.

We have examined the action of chloride of zinc, as applied under Sir W. Burnett's Patent for the prevention of dry rot, in reference to the cause of its efficacy, and its influence upon the strength of the fibres of canvas or sail-cloth.

We are of opinion that its efficacy depends upon the chemical combination of the oxide of zinc with the ligneous fibre. We have found that canvas prepared according to the specification of the Patent, retains oxide of zinc in chemical combination after it has been repeatedly washed and boiled in water, so as entirely to free it from all merely adhering salt or zinc; and that under such circumstances, when the fibre is burned, the ashes yield abundant evidence of the presence of oxide of zinc.

In reference to the strength of the prepared, as compared with the unprepared

fibre, we are of opinion that the Patent process does not tend to weaken its texture. We have unravelled pieces of prepared and unprepared canvas cut from the same piece, and have determined the weights requisite to tear their respective threads asunder, and we have not been able to detect any material difference in the average results of our trials.

(Signed) WM. THOS. BRANDE,
JOHN THOS. COOPER.

GENTLEMEN :

Albany-Road, 3rd May, 1842.

In compliance with your wishes, I have made some experiments on the chemical agencies of Sir William Burnett's Solution of the Chloride of Zinc, proposed for the preservation of various organic substances from premature decay; the result of which I have now the pleasure of communicating to you.

Assuming, as proved by previous experiments already made repeatedly, carefully, and jealously, that the process invented by Sir William Burnett exercises a marked effect in preventing premature decay in certain substances, exposed under circumstances more than usually favourable to the generation of rot in such materials; I have not deemed it needful, at the present moment, to re-enter upon the inquiry of its *preservative powers*, either for the purpose of confirming or of invalidating the results of former trials. Admitting, then, that some change is wrought in the properties of the substances submitted to it, I have confined my present labours to the attempt to show, by signs very evident to the senses of all examiners, that the changes brought about in the matters subjected to the action of chloride of zinc are effected by a *positive chemical action*, which is *permanent* in its results.

To make apparent to the eye, even of those not familiar with the character of chemical agencies that organic matters which have undergone the process recommended by Sir William Burnett, have assumed chemical properties, differing from those which belong to them in their unprepared state, I have subjected specimens of the same materials, prepared and unprepared, to the action, consecutively, of the same dye. The effect has been, uniformly, that the prepared and unprepared specimens have come out of the same dye-color of different colors; and that, when the dye, *unaided*, gives a *fugitive* color, the color on the *prepared* cloth is of a much more *fixed* character; and, generally, that the color on the prepared substance has much greater intensity. Here we have a palpable demonstration that some change has been wrought in the chemical properties of the fibres of those substances which have been immersed in the solution of chloride of zinc; and the plain and indubitable inference is, that to the new properties thus imparted, the material owes its newly-acquired power of resisting, for a much longer period, those influences which in ordinary cases induce that peculiar decomposition of the organic fibre, commonly designated by the terms "rot" and "dry rot."

Some persons may infer from the fact of the ready solubility of chloride of zinc in water, the salt being in fact deliquescent from atmospheric moisture, that it will be readily washed out of any porous or fibrous substances into which it may be introduced for the purpose of preserving it; and that then, consequently, the preservative power of the solution will be lost, and the substance be left unprotected against the ordinary causes of decay. Chemists who have given their attention to this branch of the science know, that most of the earthy and metallic salts in solution undergo partial decomposition by the mere immersion in them of animal and fibrous textures; and that the fixedness and variety of colour imparted by the dyer's art, are mainly dependent on this fact. A permanent chemical union takes place between the matter of the fibre and the earthy or metallic base of the salt. That this peculiar action ensues in the process of Sir William Burnett, I have on this occasion demonstrated, also to the eye, by taking the various tissues on which my experiments were conducted, and, after having macerated them in the solution of chloride of zinc, and dried them, I have washed some simply in cold water, others in soap and water, and, subsequently in hot water so as to remove, if all were removable, from the cloth by re-solution, whatever had been introduced by the preservative process; and even then, on subjecting these washed pieces to the dyeing process, they all came out with the evident indication of having received the chemical action of a mordant; in fact, the colour is usually more uniform, sometimes more

intense in the washed, than in the unwashed pieces.* These facts yield us sufficient proof that the change wrought in the chemical qualities of the materials operated upon in the preservative process are of a *permanent character*, not affected by the subsequent washing out or not of the really superfluous quantity of chloride of zinc, which has been deposited by the process in the interstices of the fibrous structure. The matter of the cloth has entered into chemical union with a portion of the oxide of zinc, and to this new combination we are legitimately to ascribe the new power of the fibre to resist the ordinary causes of decay.

That the cloth has actually gained a permanent accession of matter after immersion in the solution and subsequent washing, I have satisfied myself by the mechanical test of weight; but these proofs are scarcely calculated for popular demonstration.

Notwithstanding the deliquescent nature of the chloride of zinc, when a cloth has been immersed in the solution of it, and subsequently aired, the tissue seems to have acquired a certain repellent power as to water applied to its surface; not that this repulsion may not be overcome, but the cloth has manifestly less disposition to absorb water than before its maceration in the solution.

I have extended my experiments over a variety of material, in order to evidence, as much as possible, the *generality* of the chemical action. In the annexed specimens will be seen the effect on linen, woollen, and cotton; giving in a series the results of the exposure to the same colouring matter, of cloths unprepared, and prepared by maceration in the solution of chloride of zinc; of those which have been submitted to the dye as fully impregnated with the solution, and of those which have been washed from the soluble salt prior to immersion in the dye-vat.

On the whole, then, I conclude, and I think it is demonstrated by the experiments herein recited, that the organic fibres, on exposure to the chloride of zinc, enter into chemical union with a portion of the metallic base of salt, forming thence a new compound possessed of properties differing from those of the previously uncombined components. One of the most marked, and, beyond question, the most valuable of these new properties induced in the fibre, is the insusceptibility of taking on, in a confined damp atmosphere, the usual series of chemical actions which terminate speedily in the decomposition of the organic structure.

I am, Gentlemen, your very obedient Servant,

To the Proprietors of Sir W. Burnett's Patent.

CHARLES TOPLIS.

To the Proprietors of Sir William Burnett's Patent.

GENTLEMEN:

Albany-road, 17th August, 1842.

My first series of experiments on the effects of the chloride of zinc upon fibrous substances, was directed solely to the object of affording ocular demonstration that some *permanent chemical change* in the fibres of the material submitted to its action was brought about by immersion in the solution. Of the results of these trials, I had the honor to transmit you specimens, which were, I believe, amply sufficient to convince any unprejudiced observer. Since then I have, for my own satisfaction, made some few experiments, with a view to determine the *preservative power* of the chloride, under circumstances likely to give considerable confidence in the permanency of the salutary change operated upon the organic structure. I took two separate pieces of the same woollen cloth, one of which had been immersed for forty-eight hours in the solution of chloride of zinc, then dried, and afterwards washed in cold water; the other piece in its ordinary unprepared state; both were then subjected to a similar process of dyeing, in the course of which operation they both remained in the boiling fluid for some time (say twenty minutes.) The two pieces were subsequently buried in the earth of a melon-frame, and taken thence at the end of fourteen days. The unprepared piece was in a state of complete decay; the prepared piece retained its original strength of texture and colour. These specimens were placed in your hands. I have now the pleasure of sending you two pieces of sail-cloth which have been treated in the same way, and with similar results. The time they remained in the earth was three weeks.

* These specimens may be seen at the Office, 53, King William-street.

These experiments will, I conceive, go very far to remove any doubts which might be raised as to the *permanency* of the preservative power of chloride of zinc on animal and vegetable fibre; since the boiling in the dye-vat, subsequently to preparation, may well be supposed to have removed from the cloth whatever was left soluble in water, by the previous maceration in the dissolved chloride.

In my own mind, not the smallest doubt exists that a permanent chemical union takes place, as I have before intimated, between the organic fibre and the metallic base of the salt; and that to such union must be ascribed the new power, now so frequently and so satisfactorily ascertained, of resisting decomposition under circumstances well known to induce the premature decay of animal and vegetable fibrous structures.

I have the honor to be, gentlemen, your very obedient servant,
CHARLES TOPLIS.

From C. Busk, Esq., Editor of the "Microscopic Journal."

DEAR SIR :

Hospital Ship 'Dreadnaught,' Greenwich, Jan. 7th, 1843.

At the request of Dr. McWilliam, I have examined, microscopically, some portions of prepared and unprepared canvas and cloth, which are herewith forwarded. They consist of eight or nine specimens.

RESULT OF MICROSCOPIC INSPECTION.

No. 1. *Portions of unprepared Sail-cloth, which had been deposited twelve months in vaults under Somerset House, together with some prepared, and marked No 7.*

Quite rotten, and covered thickly with mildew, consisting of two species of *mucedo*, one of a yellowish color, and the other black. The yellow consisting of minute sporidia and interlaced tortuous very delicate filaments; the black of larger sporidia, and of straight branched stronger filaments. The sporidia of both are disseminated in great numbers among the fibres composing the threads, which fibres are themselves more ragged and uneven on the surface than those of unaffected threads.

No. 2. *A portion of Canvas unprepared, which was inclosed with No. 3, and sent from Bermuda.**

Appears to the eye unaffected; but on tearing portions of its interior asunder, sporidia of the dark-colored *mucedo* are found strongly disseminated among the ultimate fibres of the flax. To prove this, I have inclosed a slide, containing portions of flax from this canvas, from which you will be able to satisfy yourself as to this fact;—one perhaps of some importance, as examinations in this way would be a means of determining as to the condition of sail-cloth, or other similar materials which may be fatally affected with mildew, although outwardly presenting no mark of that disease.

No. 3. *Pieces of Canvas, unprepared from Portsmouth Dockyard.*

Very much decayed. The mildew on these specimens consist in only one species of *mucedo*, of a black colour, and probably identical with the similarly-colored one in No. 1.

No. 4. *Portions of prepared and unprepared red Cloth.*

The prepared piece of woollen cloth presents no trace of mildew, externally or internally; but the unprepared piece is very friable, and the fibres of wool in it are as it were gnawed or eroded on the surface, and sprinkled over with small bright yellow sporidia of a fungus, the filamentous part of which, if such exists, I have not been able to find.

* Portions of the same Canvas were washed thoroughly and rinsed in scalding water, after which they were placed in a cellar: and, when examined, at the expiration of eight months from that time, the prepared piece was perfectly clean and sound, and the unprepared completely rotted.

** These pieces may be seen at the Office, 53, King William-street.

No. 5. *Canvas, unprepared, marked A.*—The same as No. 1.

No. 6. *Canvas, prepared, marked A.*—No trace of mildew, externally or internally.

No. 7. *Canvas, prepared, which had been exposed with No. 1, in the vaults under Somerset House.*

No trace of mildew, externally or internally. This is a striking evidence of the preservative power of the preparation which the canvas has undergone, when it is compared with its fellow pieces No. 1.

No. 8. *Portions of sail, from on board the "Wilberforce," of prepared Canvas.*

No trace of mildew.

I shall be happy, if you wish it, to prepare slides, containing the proofs of the above statements, and which will enable their verification to be determined with great ease.

I employed a power of about four hundred lines, but one of three hundred would be sufficient.

Believe me, with much respect, yours truly,

SIR W. BURNETT, K. C. H., &c. &c. &c.

GEORGE BUSK.

Particular attention is requested to the following important Documents from the LORDS COMMISSIONERS OF THE ADMIRALTY, relative to some of the trials made at PORTSMOUTH DOCKYARD.

SIR :

Admiralty, 13th July, 1840.

With reference to your letter of the 29th of last month, I am commanded by my Lords Commissioners of the Admiralty to acquaint you, that from the report of the trials of the strength of the Cordage and Canvas prepared with the solution on your plan, as compared with that unprepared, it appears that after both were equally exposed to wet and damp, as well as to the effects of the atmosphere, the prepared Cordage is on the average about one-twelfth stronger,* and the Canvas about two-thirds stronger than the unprepared.

I am, &c. &c.,

H. E. AMEDROZ,

Pro-Secretary.

SIR WILLIAM BURNETT, K. C. H., F. R. S., &c. &c.

Copy of a Report forwarded by Sir John Barrow, together with the Report on Cordage, in page 24.

To the Admiral Superintendent.

Portsmouth Yard, 24th June, 1840.

Suspended by weights, canvas No. 3. Immersed in the solution two pieces prepared, and two unprepared, which had been placed in a damp cellar for twelve months; when tested, broke at the undermentioned weights:

Prepared.

Unprepared.

Pieces laid open.

Pieces rolled up.

Pieces open.

Pieces rolled.

Wet

Wet

Wet

Wet

broke at 414 lbs.

broke at 505 lbs.

broke at 197 lbs.

broke at 267 lbs.

Two pieces exposed on the Sheers.

Prepared.

Unprepared.

Wet broke at 293 lbs.

Wet broke at 266 lbs.

From the foregoing trials of strength, I am induced to suggest, that it would be beneficial to Her Majesty's service, were all cordage, canvas, &c., especially that for store at home, or for foreign service, dipped in this Solution, as it appears in every instance to preserve the articles from the effects of damp, mildew, and premature decay.

I am,

F. W. R. SADLER,

Master Attendant.

P. S.—The damp cellar alluded to, is under the Hemp-house, or Store.

(Signed)

W. P.

* The cordage, in this instance, was submitted to the Solution as Rope, previously tarred;—condition in which cordage cannot derive the full benefit of the Patent.
It should be prepared in the state of yarn.

Extract from a Report made by the Commander of H. M. Brig "Water-witch," dated at Sea, Sept. 23, 1840.

Having received from Portsmouth Dockyard, in March, 1839, four sails, alternate cloths of which were prepared with Sir W. Burnett's Solution, an old top-gallant-sail being allowed to remain wet for a considerable time, the prepared cloths were free from mildew, while the unprepared were much affected by it.

SIR :

Goswell Mews, London, 29th March, 1841.

Being desirous of preventing the effects of mildew in canvas employed in some of our manufacture, we procured in January, 1840, a small piece of No. 1 canvas that had undergone your process, and put it with an unprepared piece in a very damp situation, nearly excluded from the air; and on examining these pieces in November last, we found the unprepared piece nearly covered with the usual greenish appearance indicating mildew, and the prepared piece as clear as when deposited. We consider this trial so decided an advantage, that we intend in future that our canvas shall undergo your process.

We are, &c.,

CHARLES MACINTOSH & CO.,

To the Secretary, Burnett's Patent.

Patentees of Waterproof Cloths.

Extract of a Letter to Sir William Burnett, from Mr. Byham, Secretary to the Board of Ordnance, dated 19th July, 1841.

"In reference to the request contained in the latter part of your letter, I beg to inclose a Copy of a Report from the Superintendent of Ordnance Shipping, respecting the fore-sail of one of the Ordnance Sloops, prepared by your process."

Royal Arsenal, Woolwich, 19th April, 1841.

Captain Soady presents his compliments to Mr. Byham, and in reply to his note of the 3rd instant, requesting to be informed whether any trial or experiment has been carried on under his direction, with cloth, cordage, &c., which have undergone the Anti-Mildew process of Sir William Burnett,—begs to inform him, that in the month of October last, the *Somerset* Ordnance sloop was supplied with a new fore-sail that had undergone the process referred to, and that the trial has answered every expectation; the sail having been exposed to the wet and damp, without exhibiting the least symptom of mildew; whereas a new main-sail, supplied at the same time, and subject to the same exposure, that had *not* undergone the Anti-Mildew process, has become mildewed in several places: thereby justifying the opinion, that the Anti-Mildew process of Sir William Burnett tends materially to the preservation of sail-cloth.

SIR :

21 Salisbury street, 28th April, 1841.

Having just come home from H. M. S. *Terror*, I take the liberty of informing you of the success of the sails sent out in us for trial. They proved themselves much superior to the other canvas, and for work are much better, particularly where there is much wet, and that you cannot dry your sails for days together. I am sorry my log is not here, it is at Chatham, or else I could show you a copy of Lieut. M'Murdo's remark on the same subject.

It was also remarked how we expended the old sail cloth, and the saturated was never required to be repaired. As an instance,—We wore three main-top-gallant-sails out for one of the other canvas, which was used as a fore-main-top-gallant-sail, and when we arrived at Hobart Town, it was as good as ever.

If you refer to the last logs sent home from the *Terror* or *Erebus*, you will see the remarks made by the first Lieutenants of both the ships.

Wishing you all success with your trial, and also good to the service,

I have the honor to be, Sir, your obedient servant,

E. MOLLOY,

Sir WM. BURNETT, K.C.H., F.R.S., &c.

Mate, R. N.

Further Testimonial,

In confirmation of the above, respecting the Sails of H.M.S. "Terror."

SIR :

Golden Cross, February 16, 1843.

In reply to yours, in relation to the wear and condition of the two top-gallant-sails supplied to H.M.S. *Terror*, which had undergone the Patent preservative process, I feel great pleasure in stating it was most satisfactory, and have to regret that all that ship's canvas had not been prepared, particularly the spare canvas, which was nearly all destroyed by dampness, as well as a quantity of small cordage and woollen stores.

As senior Lieutenant of that ship, I had a very good opportunity of testing it : bending one main top-gallant-sail, prepared with your Solution, against two fore of the other canvas, the former proving itself far superior, after a very considerable time ; the dates, I am sorry to say, have escaped my memory, and as the logs of ships on that station are not transmitted, it will remain, I fear, unproved up to the time they return.

I can only say, that should I at any future time have to do with a sea-going ship, I should regret that all the canvas might be prepared.

I have the honor to be, Sir, your obedient servant,

A. M-MURDO,

To Sir W. BURNETT, K.C.H., F.R.S., &c. &c. &c.

*Lieut. Royal Navy.**Letter from the late Joseph Somes, Esq., M. P., dated London, May 1, 1841.*

SIR :

An awning made of "Burnettized" canvas, which was supplied to the *Boadicea*, (one of my ships,) in July, 1840, has been in her voyage to Ascension, and is now returned in a surpassing state of preservation ; it being now in no way discolored, but actually whiter on both sides than it was when new, and apparently of undiminished strength.

I consider this trial such conclusive evidence of the value of the Patent, that I shall have all my canvas for awnings and studding-sails transmitted to Sir William Burnett's process, and you are at liberty to make any use you think proper of this information. The awning may be seen at 35, Broad street, Ratcliff.

I am, &c.,

To the Secretary of Sir Wm. Burnett's Patent.

JOSEPH SOMES.

Further Testimonial

From the late Joseph Somes, Esq., dated London, Nov. 29, 1843.

I hereby certify that I have had upwards of 24,000 yards of "Burnettized" canvas in use, as awnings and sails, on board my ships, in all quarters of the globe—the greater part of which have been in wear more than three years, in India and China ; and I find, on their return to this country, that they are invariably free from mildew, and, comparatively, in a good state of preservation. Having experienced such beneficial results from the adoption of Sir W. Burnett's process, I shall use it more extensively, and recommend it with the greatest confidence.

(Signed) JOSEPH SOMES.

To the Secretary of Sir W. Burnett's Patent.

MY DEAR SIR :

16, Upper Seymour street, Portman square, 9th Feb., 1842.

In reply to your question respecting the effect of your Solution upon the sails and awnings of the vessels of the Niger Expedition, the canvas of which was steeped in it before they were made, I have much pleasure in being able to state that they were most effectually preserved from mildew, and this after as severe a trial as canvas could well undergo, being alternately exposed, during several months, to heavy rains and a burning sun, with the thermometer sometimes at 93°, and generally much above 80°.

I am, my dear sir,

H. DUNDAS TROTTER,

To Sir W. BURNETT, K.C.H. &c. &c. &c.

Capt. R. N.

We, the undersigned Captain and Officers of the Niger expedition, on board the Wilberforce, having paid attention to the general wear and condition of the sails, awnings, and tents, supplied the vessel, which had been subjected to Burnett's Patent preservative process, feel pleasure in testifying to its efficacy; the canvas generally having been greatly exposed to tropical rains and a vertical sun, and notwithstanding that provided by contract to the ship was of a much lighter description than that issued in the Royal Navy.

The rain awnings would appear to be made somewhat water proof by the preparation, as they are less pervious to rain than common canvas, and are likewise more flexible and tougher than that which has not undergone the process.

We are also most decidedly of opinion that the Patent is a perfect preservative against mildew and rot, as is manifestly shown by the present condition of the sails and awnings, they being still good and serviceable; which would in all probability, had they not been "Burnettized," have become rotten and useless.

Given under our hands, on board the Wilberforce, at Cape Coast Castle, this 29th day of March, 1842.

WILLIAM ALLEN,	{ Captain and senior Officer present of
WILLIAM ELLIS,	{ the Niger Expedition.
WILLIAM FORSTER,	Commander of H.M.S. Soudan.
M. PRITCHETT, M.D.,	Master of H.M.S. Wilberforce.
	Surgeon of H.M.S. Wilberforce.

* * See next page, Lieut. Cockraft's Testimonial respecting a main deck awning of the *Albert*, used on the same expedition.

Letter from Captain W. Cook, one of the Commissioners appointed by Government for conducting the Niger Expedition.

DEAR DOCTOR :

H. M. Steamer Wilberforce, at Sea, 5th April, 1842.

In compliance with your request, I herewith give you my opinion as regards Sir William Burnett's Patent composition for preserving canvas, &c. I do this the more readily, because I have narrowly watched its effects upon the sails of this vessel, during the last twelve months; and I have no hesitation in asserting that, but for the Patent composition, they would long since have rotted from the yards. In confirmation of this, I may state that during the late rainy season, when there was so much sickness on board, I have frequently known the sails to have been rolled up to the yards for many days together, without an opportunity of airing or drying them.

Under the same circumstances, sails made of the best bleached coker canvas, without the composition, would have been destroyed; whereas these sails, though not originally of the best sail-cloth, are still bent and in constant use, without exhibiting the least signs of mildew.

I remain, my dear Sir, yours faithfully,

M. PRITCHETT, M.D., &c. &c.

W. COOK.

Woolwich, 29th November, 1842.

With reference to the sails, awnings, &c. of H.M.S. Vessel Wilberforce, which were prepared with Sir W. Burnett's Patent Solution two years since, and which have been, since that period, much used, and greatly exposed to heavy rain, and to the intense heat of the climate of Western Africa;

I have to acquaint you, that the sails, &c., so prepared, continue in a good and serviceable condition, although the sail-cloth in the first place was not of the best quality.

It is also my opinion, that, had not the sails, &c., been so prepared, they must, long ago, have been destroyed, by constant wear and the effects of climate. In further proof of the efficacy of the Patent, I may state that the old fore-top-sail which was used to sweep her bottom after getting ashore in the River Niger, in July last, is still in so good a condition, that a piece of it is now in use as a tarpaulin for the after hatchway,

(Signed) W. H. WEBB, Lt.,

Commanding Officer of H.M.S.V. Wilberforce.

SIR : 12, Northampton square, St. John's street road, London, Dec., 1844.

In reply to your inquiry as to how far the sails, awnings, &c., prepared by being steeped in your Patent Solution were preserved thereby, I beg to state that during the two years I commanded H. M. Steam Vessel *Albert*, I had many opportunities of testing its effects, and found in all cases the result to be very satisfactory.

The awnings prepared by you were subjected to every alteration of atmosphere, being kept spread night and day, both in the dry and rainy seasons (which I considered to be the severest test to which they could have been subjected.) These awnings lasted, at least, twice as long as it is possible for unprepared canvas to have done under the same circumstances; and they, when worn out, presented as white and unmildewed an appearance as they did when first put on board. The sails also, which were frequently many days together wet through without being loosed (owing to the incessant rain,) never became either mildewed or warm, while a top-sail, made at Ascension of unprepared canvas, became black with mildew from head to foot. In fact, the prepared sails when repaired with new canvas, presented after a short exposure to the rain a checquered appearance, owing to the new canvas becoming warm and turning black. A new unprepared quarter-deck awning supplied by H. M. Steam Vessel *Kite* was worn out in fourteen months, while a main-deck awning much worn in the NIGER EXPEDITION was subsequently used by me for twenty months, and then became unserviceable almost as much from its being cut up with shot, and torn by being kept spread in tornadoes to preserve the health of the people, as from its natural decay; this awning must have been in use for nearly thirty months, being constantly spread and exposed to rain, sun and damp. This I think is as satisfactory a test of the efficacy of the Solution as can be wished.

I think it necessary further to state that the process gone through, does not in any way thicken the cloth, or render it difficult to handle, it being as soft and pliable, in fact rather more so than unprepared canvas. In conclusion, I should certainly say that a great saving is effected by your invention; and its adoption by vessels, especially those employed in the *African* trade, would be of incalculable advantage to them.

I have the honor to be, your very obedient servant,

(Signed) MACLEOD B. COCKRAFT, Lieut.

Late commanding H. M. Steam Vessel Albert, on the West Coast of Africa.

To Sir W. BURNETT, K.C.H., &c. &c. &c.

SIR : Southampton, December 1841.

I beg to inform you that, having in compliance with your request subjected a slip of canvas three feet long and four inches wide, eighteen inches of which had been saturated with Burnett's Patent preparation, to the action of an extremely damp part of my cellar, from July last for about two months open, and afterwards folded up and subjected to the pressure of an iron weight in the same place, but for some weeks under water which had found its way into my cellar; on examining it recently I find the part perfectly saturated with the composition sound and good, but the part wholly free from the influence of the said composition rotten and easily torn. I therefore do not hesitate to record my most favorable opinion as to the value of the discovery, which seems effectually to destroy the principle of vegetation so productive of fermentation, and consequently of rot, or decay; and I think considerably lessening the probability of spontaneous combustion in sails or ropes on board of ships, unavoidably, at times, under the influence of wet or damp.

Yours truly,

F. W. JERNINGHAM, Esq., Southampton.

W. WARD.

Memorandum :

Select Committee Office, Woolwich, 3rd March, 1842.

Attended this day with Mr. Jackson, and saw deposited in a hole dug for the purpose, close to the outside wall of the old dipping square, Royal Arsenal, near the South Eastern Angle, six pieces of canvas and three pieces of woollen cloth, prepared with Sir William Burnett's Patent preservative against dry rot, mildew, &c., and six pieces of canvas and three of cloth unprepared, previously cut off from the same canvas and cloth. The hole was about four feet deep. The specimens

were placed alternately over each other, prepared and unprepared in four heaps, two of each sort next the ground under a wooden box without a cover, inverted, the earth thrown in over it. *The spot was selected for its damp situation and its exposure to the rays of the sun. Damp and warmth combined being most productive of mildew.*

(Signed) HENRY PALLISER, Captain R. A.,
Secretary to Committee.

DEAR SIR:

Woolwich, 9th September, 1842.

In reply to yours of the 9th, I beg to inform you that the prepared and unprepared specimens of cloth and canvas which were taken out of the hole in the Arsenal, and examined in your presence, were *afterwards washed in plain water and dried.*

They were then, on the 22nd July, put together into a deal box, perforated in several places, and placed in a damp sink, but not in contact with the water.

They will be examined by the Committee at their next meeting.

I remain, dear Sir, your obedient servant,
C. JACKSON, Esq., &c. &c. &c. (Signed) HENRY PALLISER.

DEAR SIR:

Select Committee Office, Woolwich, 23rd September, 1842.

The specimens of cloth and canvas have been taken up, after having been nine weeks exposed to a damp air *subsequent to washing.*

The prepared canvas was clean and uninjured, the unprepared covered with mildew.

The Committee have made their report to the Master-General; and the box containing the specimens is at this office, and open to your inspection at any time until 4 P. M. daily.

I remain, Sir, yours faithfully,
C. JACKSON, Esq., &c. &c. &c. (Signed) HENRY PALLISER,

Secretary.

Official Report,

SIR:

Dated Office of Ordnance, 10th October, 1842.

Having laid before the Board of Ordnance your letter dated the 8th instant, signifying the request of the proprietors of Sir W. Burnett's Patent to be furnished with a copy of the Report of the Select Committee upon the experiments made in the Royal Arsenal at Woolwich, with canvas and woolen prepared with Sir W. Burnett's Solution, and that they may also be allowed to have the specimens at their Office:

I am directed to acquaint you, that the *Report which has been received on the subject of Sir W. Burnett's preparation for the prevention of mildew is FAVORABLE to the invention.* But the Board must decline to furnish you with a copy of it, or with the specimens.

I am, Sir,
C. JACKSON, Esq., Your most obedient, humble servant,
Sir W. Burnett's Patent Office. (Signed) R. BYHAM.

Pacific Steam Navigation Company's steam-vessel 'Chile,'
Callao, 13th March, 1842.

MY DEAR SIR:

It affords me much pleasure to be able to report very favourably of the process of 'Burnettizing' sails, as exemplified by those of the Pacific Steam Navigation Company's vessels *Peru* and *Chile*, more particularly shown in the fore and aft sails, which have been bent ever since the steamers left England (now seventeen months,) except at short intervals whilst painting the spars, and during the repairs of the latter vessel. The head-sails, although exposed to the vicissitudes of alternate wet and solar heat, have hitherto had no repairs; and the main-sails have only required canvas to be shifted where the action of the heat and smoke from the funnel had caused deterioration.

For the sails of steam-vessels, where the saving of time in port is of so much importance, and labor so expensive, I consider the application of this invention to be of the utmost utility; as they may be left furled to the yards, gaffs, or stays, with

impunity, until required for use in the ordinary course of the succeeding voyage. This will particularly hold good with the coasting steamers of the British Islands, where, unfortunately, the vast importance of having good sails constantly bent, has been so wantonly overlooked in one or two awfully fatal instances.

Your faithful and obedient servant,

To the Secretary of Sir Wm. Burnett's Patent.

GEORGE PEACOCK.

SIR :

Junior U. S. Club, Aug. 2nd, 1842.

I regret that indisposition has been the cause of my not having replied to your note of the 20th July, ere this.

And in answer to your inquiries respecting the sails of Her Majesty's steam vessel *Devastation*, that had been prepared with your Solution, I regret to inform you that only ONE SAIL was so fortunate as to be submitted to your preparation, but which was sufficient to prove, *beyond doubt*, the merits of YOUR VALUABLE invention, as it was the only sail, after a trial of three months of incessant wet weather, that had not the slightest appearance of mildew; whereas all the others, notwithstanding every means were taken to prevent it, became more or less mildewed, and I feel perfectly convinced, had they been prepared with your Solution, nothing of the kind would have taken place; and I am satisfied from its incomparable merits, that the day is not far distant, when not a sail, or bolt of canvas will be permitted to be supplied to Her Majesty's ships, without having been prepared with your VALUABLE discovery.

I have the honor to be your obedient servant,

To SIR WM. BURNETT, K. C. H.,
&c. &c. &c.

G. J. GORDON,
Late Commander of H. M. S. Vessel 'Devastation.'

Further Testimonial.

DEAR SIR WILLIAM :

H. M. S. V. 'Cormorant,' Callao, 7th Sept. 1845.

I am much surprised at hearing from Mr. Holdsworth, that you have not received the letter that I wrote you last *April twelvemonth* from Tahiti, giving an account of an experiment we tried with an awning that had been prepared by your (I think) *invaluable Patent*: and I have much pleasure in congratulating you on its complete success as the accompanying document will testify. The suit of sails that we now have bent are *very much* stained, and mildewed; and in fact, are useless—with the exception of the studding sails, which have undergone your preparation, and are, at this moment, as free from stains and mildew as when first taken in use, which is now more than two years: of course they have not been as much exposed as the other sails, being usually unbent in harbor; but I can assure you they have been *well tried*; as I *invariably* set sail when there is the slightest prospect of its being useful; and I have become, if possible, a greater advocate for all sails being prepared with your Solution, than I was when in command of the *Devastation*, when I first became acquainted with its value.

I hope you caution the persons who superintend the preparation of the canvas to be *very particular* with it, as I am convinced should it ever fail, it is from their negligence, and *not* from any imperfection in the solution; so that your credit is entirely in their hands.

I must now conclude, with every wish for the success for your Patent.

Believe me, very truly yours,

(Signed)

G. J. GORDON,
Commander, R. N.

The rain awning supplied to Her Majesty's steam-vessel *Cormorant*, having undergone Sir William Burnett's preservation Patent, was kept spread for five successive days in rainy weather, when it became thoroughly saturated with water. It was then rolled up and exposed to a tropical sun and rains, for the purpose of testing the preparation, and on opening it, after remaining in this state for ten days, it was found to be entirely free from mildew or stains.

The quarter-deck awning, which had not been prepared, was on the contrary much mildewed after being exposed in a similar manner, only a few hours.

From this trial, as also from other circumstances which have come under our observation, we are of opinion that Sir William Burnett's Patent, for the preservation of canvas, is invaluable.

Given under our hands, on board H. M. steam-vessel *Cormorant*, at Callao, this 1st of September, 1845.

(Signed) G. J. GORDON, Commander.
R. HILL WHARTON, Senior Lieut.
J. W. WARREN, Master.

DEAR SIR:

8, Lockyer-terrace, Plymouth, 6th November, 1845.

During three years' experience on the Coast of Africa, I have seen your prepared canvas tried in every form and shape, with the greatest success: in fact, I never saw a spot of mildew on prepared canvas (either in awnings or sails,) when I have frequently seen unprepared canvas completely covered with mildew in six or eight hours.

I have the honor to be, Sir, your obedient servant,
(Signed) JOHN SECCOMBE, Lieut., R. N.,

Late of H. M. Ship '*Espoir*' serving on the Coast of Africa.
To Sir William Burnett, K. C. H., &c. &c.

'Trent,' Nov. 10, 1843 (Southampton.)

I have much pleasure in bearing testimony to the state of the sails on board the Royal Mail Steam-Packet Company's Ship *Trent*, under my command—one suit of which has been almost constantly bent for nearly two years, and, during that time, exposed to the sudden vicissitudes of heat, wet, and cold, peculiar to our voyages; also, that the spare suit have been on board the ship the same period of time, and occasionally bent, when those generally used required repair; and that, in neither case is there one spot of mildew—having carefully examined every sail a few days previous to our arrival in port.

I am, your most obedient servant,

To the Secretary of Sir W. Burnett's Patent. F. S. BOXER, Captain.

SIR:

Royal Mail Steam-Packet Company's Offices,
Southampton, 8th January, 1844.

I beg to acquaint you that I have examined the condition of the sails originally supplied to the Royal Mail Steam Packet Company's ships *Thames*, *Trent*, and *Medway*, said to have been 'Burnettized,' and found the canvas in a state of good preservation, free from mildew; but as there are none of the stamps remaining, I have no means of ascertaining the fact if these sails actually underwent the process referred to.

I am, Sir,

To CHARLES JACKSON, Esq.,
Secretary, &c. &c.

Your obedient servant,
RICHARD BARTON, Superintendent.

Testimonial from the Late E. N. Kendall, Esq., R. N.,

Formerly Superintendent of the ROYAL MAIL STEAM PACKET COMPANY'S vessels, under whose inspection the Sails above mentioned were prepared with SIR WM. BURNETT'S PATENT.

MY DEAR SIR:

Peninsular and Oriental Steam Navigation Company's Offices,
51, High-street, Southampton, 4th March, 1844.

I regret to say that the *Oriental* sailed on the 1st instant, the date of your note. I was unable to obtain from Captain Soy that which I know he would have been ready enough to grant, namely, a further testimonial as to the efficacy of Sir Wm. Burnett's preparation in destroying or rather neutralizing the offensive effluvia from bilge-water; but I can afford myself the most ample testimony to the fact, not only in the *Oriental*, but in other vessels in the Company's employ, where the experiment has been made with the happiest results; so that I have no hesitation whatever in recommending its application, not only for the purpose of purification, but because of its preservative properties, of which I am more and more convinced by experience.

It is now nearly three years and a half since I recommended to the Directors of the Royal Mail Company the propriety of having the canvas of ALL their ships subjected to this process; but from some unexplained cause I was not successful in carrying out my views to their fullest extent. Some of the sails were however made of 'Burnettized' canvas, and to the best of my recollection they were the following, viz.:

Medina,	Trent,	} in all about 760 bolts.
Thames,	Isis.	
Medway,		

Since I have held the appointment of Superintendent to the Peninsular and Oriental Steam Navigation Company (three years,) with twelve ships under my charge, I have had abundant opportunity for testing the value of the opinion which I had previously entertained as to the utility of Sir W. Burnett's invention, and feel pleasure in recording that my favorable impressions have in every instance been most satisfactorily confirmed. With my own will I would never use a yard of canvas that had not undergone the process.

I am, my dear Sir, yours truly,

CHARLES JACKSON, Esq., R. N.

E. N. KENDALL.

*Peninsula and Steam Navigation Company's
Offices, Southampton, 27th May, 1844.*

DEAR SIR:

I hereby certify that the sails of the Royal Mail Steam-Packet Company's ships *Thames* and *Trent* were subjected to Sir William Burnett's process before being made up. I also inclose the certificate of Captain M'Leod, of the *Great Liverpool*, which you will find entirely to bear out the opinion which I have so often expressed as to the efficacy of the preparation.

Yours, truly,

E. N. KENDALL.

C. JACKSON, Esq.,

Secretary to Sir W. Burnett's Patent.

SIR: *'Great Liverpool' steam-ship, Southampton, 27th May, 1844.*

In compliance with your order to report on the sails of this ship which were made of 'Burnettized' canvas, I have to inform you that a great part of the said sails have been in constant use for nearly three years, and that they have been frequently furled for fifteen and twenty days together, in head winds, and when at anchor; that not the slightest appearance of mildew has been observed while bent or in the sail-room, and that the canvas is in every other respect equal to that used for sails.

To Lieut. KENDALL, R. N.,

Superintendent, Peninsula and
Oriental Steam Navigation Company,
Southampton.

I am, Sir,

Your obedient servant,
A. M'LEOD.
Commander.

*Extract from a Note, dated the 29th March, 1845, from A. H. HOLDSWORTH, Esq., to
SIR WILLIAM BURNETT.*

I wrote a few lines before I left London; I have now the pleasure of mentioning that I have just heard from Gordon, of the *Cormorant*, in which letter the following passage occurs:

Pray make my compliments to Sir William Burnett, if you see him, and say nothing can have behaved better than his canvas. Our quarter deck awning, that had not been prepared by him, in *one night* became full of black spots, and in fact became completely mildewed. I then ordered one that had been prepared by his process to be brought on deck, to be wetted, and then rolled up and kept in that state for *ten* days, exposed to a hot sun and heavy showers near the funnel; and at the expiration of that time it was dried, and found to be as good as when it came from the sail-loft.

This is as satisfactory an account as you could wish to receive, but you have so many proofs, that it is perhaps of little value. I have, however, only obeyed his wish, in troubling you with it.

SIR :

3, Great Queen-street, Westminster, 12th June, 1844.

Since my arrival in England I have been desired, for the information of my Lords Commissioners of the Admiralty, to make a Report upon the awnings dipped in Sir William Burnett's Solution, which were sent out to Rio de Janeiro for the use of H. M. Receiving Ship *Crescent*, then under my command.

They had been in constant use for about twelve months, were not in the least affected by mildew, or rotted by alternate hot sun, and rain, as former awnings were.

My opinion is, they will last as long again.

I have further to add, that several of H. M. Ships on the station made a practice of sending some of their sails on board of the *Crescent* to be taken care of until going to sea. I remarked those dipped in the solution were perfectly free from mildew, whilst the others were much affected. I have the honor to be, Sir,

Your most obedient and humble servant,

(Signed) M. DONELLAN.

Lieutenant late commanding H. M. S. 'Crescent.'

To the Honorable SIDNEY HERBERT, M. P., Admiralty.

Extract of a Letter, dated Bombay, 31st October, 1845.

DEAR SIR :

The Commander of my Ship *Buckinghamshire*, just returned from a voyage to China, speaks so highly of the batch of canvas you sent to me, both as regards the quality of the canvas, and the benefits derived from "Burnettizing" it, that I beg you will send me by an early opportunity on my account (100) one hundred bolts of the same quality as before.

I wish the canvas to be of exactly the same quality, the only difference from the last consignment being in having a few more of the heavy Nos., on account of the large size of my ships.

I hope I shall be able to persuade some of the ship-owners here to patronize the "Burnettized" canvas to a great extent, as soon as its real value becomes better known.

Dear Sir, yours sincerely,

(Signed) FRAMJEE COWASJEE.

To Charles Jackson, Esq., Secretary to Sir William Burnett's Patent.

DEAR SIR :

Ship Buckinghamshire, London, 2nd Dec., 1846.

Having tried your "Burnettized" canvas on board this ship for the last three years, I am anxious to add my testimony of its superiority over canvas in an unprepared state.

Since I have used your prepared canvas, my sails and awnings have been entirely protected from mildew and rot. The sails were sewn with unprepared twine; after they had been exposed to much wet, the twine became rotten, leaving the canvas perfectly free from any tendency to decay.

I am, dear Sir, your most obedient servant,

(Signed) D. MACGREGOR,

Commanding the Ship Buckinghamshire.

C. Jackson, Esq., Secretary, &c., &c.

Extract from an Official Report, dated Portsmouth Dockyard, 24th September, 1847.

SIR :

In obedience to your memorandum of the 23d instant, respecting the canvas that was rolled upon rollers, and had been deposited in the cellars of the hemp-house since April, 1839, we beg to report that we have carefully surveyed the said canvas, and find that one of the pieces was prepared with Sir William Burnett's solution, and the other unprepared. The latter is very much mildewed in every part, and in several places so rotten that it broke through on being removed from the roller, which was very much decayed; whereas the canvas prepared with Sir William Burnett's Solution is perfectly free from mildew, excepting a few small spots, which appear to have been caused by its being in contact with some particular fluid; and

the sound state of the roller on which the prepared canvas was rolled, compared with the other, is very remarkable, it having been cut from the same spar.

We remain, Sir, your most obedient servants,

(Signed) CHARLES BROWN, Master Attendant.
J. TAPLIN, Master Sailmaker.
B. HARVEY, Master Rigger.

To the Admiral Superintendent, &c. &c. &c.

Prepared Cordage.

SIR: *Admiralty, 8th January, 1842.*

"I am commanded by my Lords Commissioners of the Admiralty to send you herewith, a copy of a report from the officers of Portsmouth Yard, of trials of strength of cordage and canvas prepared with a solution of chloride on your plan.

I am, Sir, your most humble servant,

To Sir WILLIAM BURNETT.

J. BARROW.

SIR: *Portsmouth Yard, June 24th, 1840.*

Having made the undermentioned trials of strength of cordage and canvas prepared with a solution of chloride on the plan of Sir William Burnett, also of corresponding sorts unprepared, agreeably to your directions, I beg to report the result as follows, as ordered by your memo. of the 22d instant:

Cordage $2\frac{1}{2}$ inches, 25 thread.

		Tons.	cwt.	qrs.	lbs.	
Italian white, prepared,	-	2	10	3	$7\frac{1}{2}$	{ Hung up and exposed to wet and dry in Dr. Henderson's garden.
Ditto unprepared,	-	2	9	3	$26\frac{1}{2}$	

Unprepared broke in the splice.

Ditto prepared,	-	2	7	3	$7\frac{1}{2}$	{ Hung up at the sheers, exposed to wet and dry.
Ditto unprepared,	-	1	19	3	$7\frac{1}{2}$	

Unprepared broke in the splice.

Ditto prepared,	-	1	9	2	$7\frac{1}{2}$	{ Buried in the mud, in the South Cam- ber.
Ditto unprepared,	-	1	8	3	$7\frac{1}{2}$	

Unprepared broke in the middle.

Ditto prepared,	-	1	9	3	$7\frac{1}{2}$	{ Under water at the South dock- gate.
Ditto unprepared,	-	1	12	0	$7\frac{1}{2}$	

Unprepared broke in the splice.

Ditto prepared,	-	0	14	2	0	{ Hung under the arch at the end of the South Camber, under water, and out of it, as the tide ebbed and flowed.
Ditto unprepared,	-	0	8	0	0	

See Testimonial signed H. E. Amedroz, for the Secretary of the Admiralty, dated July 13, 1840, as to prepared Cordage and Canvas, in page 23.

SIR: *Jerusalem Coffee-house, London, 12th May, 1842.*

I have to acknowledge the receipt of your letter of yesterday's date, requesting me to give my opinion of Sir William Burnett's Solution for the preservation of

rope, canvas, planks, &c.; a large quantity of each of these articles having been supplied in a prepared state to the late East India Ship Viscount Melbourne, lost in January last, in the China Sea.

It is with pleasure I give my testimony to the value of Sir William Burnett's Solution, having had ample opportunity to judge of its good effects, during a period of fifteen months, viz: from October 1840 to January 1842, when my unfortunate ship was lost. I will briefly give my reason for judging thus favorably of it, viz:

1. ROPE. The Melbourne's rope was supplied and made by the same person, of the same description of yarn; *one-half* was tarred in the usual manner, the *other half* was dipped in Sir W. Burnett's Solution. To give both kinds a fair trial, braces, buntlines, clue garnetts, &c., were rove in opposition to each other. After several months had elapsed, the prepared was found to wear better than the tarred rope, and to have the additional advantage of being *much lighter*, easier to work, and causing *less* "chafing" to the sails. It is decidedly to be preferred for "running gear."
2. CANVAS. All the Melbourne's new sails and store canvas had been dipped in the solution, which made them softer, consequently *lighter to work*, than they would otherwise have been. There was not the least appearance of *mildew* during the voyage.
3. PLANKS. The launch was lined with planks prepared in the solution already mentioned; with the exception of one month, when her services were required for the ship, about thirty sheep were constantly kept in her, without the slightest detriment to the wood. This boat was the providential means of saving the lives of twenty-seven people, who were exposed in her to the elements for thirteen days, during which time they traversed 1000 miles. I consider that the excellent *sound* state in which she was, is to be attributed to her *planks for lining* having been prepared in Sir W. Burnett's Solution; and having had good cause to know its value, would strongly recommend it to the notice of all persons connected with shipping.

I have the honor to be, Sir,

Your most obedient, humble servant,

CHARLES W. M. S. M'KERLIE, late H.C.S.

Commander late East India Ship Viscount Melbourne.

To the Secretary for Sir W. Burnett's Patent.

GENTLEMEN:

14 Macfarlane street, Glasgow, 12th February, 1844.

At your request we have much pleasure in certifying that, so far as our experience goes, your process of "Burnettizing" ropes has been very successful, rendering them much more pliable, and not nearly so liable to decay, wet having no injurious effect on them; the same quantity of ropes now serving us, on an average, fully double the time they formerly did when unprepared.

We are, Gentlemen, your obedient servants,

(Signed) THOMAS FRAME & Co.,

To Messrs. W. Middleton and Son,

Wood Merchants.

68, Glassford street, Glasgow, Agents for Sir W. Burnett's Patent.

Protection of Woolen from Moths.

SIR:

Admiralty; 27th May, 1839.

I beg to acquaint you, that on the 4th December, 1838, I placed several pieces of your prepared cloth and fur in a tin chest, containing some clothing much infested with the moth: upon examination, it appears that the cloths and fur, so prepared are now in the same state as when first placed in the chest, *untouched by the moths*;

indeed the insects appear to me to be *totally destroyed*, for nothing but the cases or skins remain in the chest, which I conceive can only be attributed to the effects of your preparation.

I have the honor to be, Sir, your most obedient, humble servant,

(Signed) THOS. MORTON.

To Sir W. Burnett, K.C.H., &c. &c.

Further Testimonial.

SIR :

Admiralty, 1st July, 1841.

With reference to my Report to you of the 27th May, 1839, I have again examined the marine clothing (chiefly great-coats, articles the moths make great havoc with, and which were much affected with them,) contained in a tin chest in my custody, and amongst which clothing several pieces of your prepared cloths and fur were placed, on the 4th December, 1838. I now find the cloths and fur so deposited remain untouched by moths, and they appear to me to be in the same state as when first deposited in the chest; and I have no hesitation in stating, that your prepared cloths have been the means of destroying the moths that were in the chest, previous to the introduction of your prepared cloths and fur.

I have the honor to be, Sir, your most obedient, humble servant,

(Signed) THOS. MORTON.

To Sir W. Burnett, K.C.H., &c. &c.

PART II.

CHAPTER I.

CHLORIDE OF ZINC AS A SANITARY AGENT.

Copy of a letter from SIR WILLIAM BURNETT, M. D., Director-General of the Medical Department of the Navy, to the SECRETARY OF THE ADMIRALTY.

SIR :

Admiralty, 20th May, 1848.

In consequence of the numerous reports, both written and verbal, which have been made to me during the few past years respecting the application of the Solution of chloride of zinc, as a disinfecting, or, at all events, as a deodorizing agent, I have been induced to request you will be pleased to lay the accompanying papers before my Lords Commissioners of the Admiralty, convinced that whatever tends to increase the comforts or to improve the moral and physical condition of all classes of men in Her Majesty's Naval Service, will meet with their Lordships' most favorable consideration.

Presuming that the value of the chloride of zinc as a preservative of vegetable fibre is now established beyond all doubt, I may be permitted to call your attention to its effects when brought into contact with noxious gas in whatever way generated, or with putrid animal or vegetable substances evolving noxious odors, either of which, if indeed they be not chemically the same, can seldom exist for any length of time in ill-ventilated rooms or in densely populated districts, without producing disease, and frequently contagious diseases. The application of the fluid to correct the factor of bilge-water is now in general use both in vessels of war and in merchant vessels, whether employed in the conveyance of goods or passengers, and it is admitted on all hands, with the most unquestionable success. In the Peninsular and Oriental Steam Navigation Company's vessels, the experiment was fairly tried, so far back as 1844, and with the happiest results. The same proof of its effects has been observed in her Majesty's ships *Rapid*, *Rhadamanthus*, *Childers*, *Fisgard*, *Stromboli*, *Imaum*, and *Rosamond*.

In some of these vessels, and in others not herein mentioned, the effluvia had seriously affected the health of the people on board, causing as in the *Stromboli*, oppressive headache, dyspepsia, and sleeplessness. Such was the relief obtained in the latter vessel, that the Honorable Captain Plunkett has remarked, in a letter dated 22nd January 1845, that were the solution not allowed by Government he would provide it at his own cost. In the *Rosamond*, formerly the *Eclair*, the surgeon reports that the most trifling catarrhal complaints were frequently accompanied with a low typhoid form of fever until by the copious use of the solution, "a noisome factor," which existed on the fore orlop, or troop deck had been removed.*

* *Vide Reports printed by Order of the House of Commons.*

The apparent effects of the solution in three line-of-battle ships in the Mediterranean was still more remarkable. In two of these, the Albion and Rodney, in which it was only sparingly used, the effluvia from the after-holds, in which there were salt provisions, and consequently leakage to a certain extent, was very disagreeable, while the smell from the bilge-water rendered the cockpit cabins scarcely habitable. In the Vanguard, in which it was used according to the directions given, the surface of all the timbers and planking in the hold being thoroughly imbued with it, there was little or no unpleasant effluvia, and the number of her sick were, in consequence, less numerous, and the diseases less severe, than in either of the two other vessels employed in precisely the same duties and localities.

In a communication from Commander Ryder, of a recent date, there is further evidence of the great advantages to be derived from a proper use of the solution in steamers, particularly within the Tropics, where disease is more apt to be engendered by the accumulation and decomposition of foreign matters in the holds of these vessels, such as indeed appears to have been the case in Her Majesty's ship Growler, which was lately employed in conveying free negroes from the coast of Africa to the West Indies. The surgeon of that vessel states, that he considered the exciting cause of the fever which attacked the greater part of the crew, was the effluvia evolved from the accumulations in her holds and bilges, which (while she was being cleared out at Bermuda) was readily neutralized by the solution, with the effect of thoroughly eradicating the disease.

The value of the solution, as a sanitary agent, I think I may be permitted to state, has been established by the most unequivocal proofs. Noxious gases are speedily deprived of their more poisonous qualities in its presence, while the odors of corrupt or diseased animal substances, even if arising from a living body, are rendered imperceptible or innocuous, if not annihilated; these, there is every reason to believe, are not only frequently the direct source of fatal and malignant diseases, but they are chiefly instrumental in conveying the principles of contagion from one person to another, when from the debilitating influence of a tainted atmosphere, they have acquired that property.

By a report lately presented to the Commissioners of Sewers, the solution appears to have had a vast superiority over several other deodorizing agents employed in a series of experiments performed under their immediate inspection on cesspools and other receptacles of filth, with the view of rendering the removal of these matters less dangerous to the communities in their neighborhood. In proof of its efficacy under these or similar circumstances, and consequently of its power over those miasmata so fruitful of typhoid fever, I have already submitted for your consideration a number of documents, in which its beneficial effects were freely admitted, and in particular I took the liberty of directing your attention to one from the Chairman of the Board of Watford Union, and to another from the Governor of the Workhouse of that parish; and also to a communication from Dr. Lindsay to the Right Honorable Lord Auckland. These, however, form but a small portion of the documentary evidence now in my possession relative to the deodorizing properties of the solution.

There is not, so far as I am aware, any means known by which a specific contagion may be made perceptible to the senses, in contradistinction to a fever-exciting miasm; if such an entity does really exist in a separate form, Professor Liebig supposes it most readily attaches itself to certain noxious gases, and by that means propagates the peculiar disease to which it belongs. These gases, however, as previously observed, are capable of being destroyed by the solution, and it seems not unreasonable to infer the contagion also; but if this be not admitted, it is clearly demonstrable that, from the want of a proper vehicle of conveyance, it must be rendered at all events infinitely less diffusible. In this light, therefore, the solution may be viewed as a disinfectant. The following documents bear more particularly on these points.

Several instances are reported in which it was considered to have arrested or retarded the spread of contagious maladies. In September last, erysipelas began to infest the patients in the Royal Marine Infirmary at Woolwich; it speedily acquired considerable virulence, became contagious, and carried off several men who were under treatment for other ailments of minor importance. On this being reported, I caused the Deputy Inspector to adopt the usual precautions required on these

occasions, and to cause the vapor of the solution to be diffused throughout the wards by hanging up pieces of woollen cloth moistened with it, and by sprinkling it occasionally on the floors and bedding. In the course of a few days, after the employment of these measures, the spread of the disease was arrested, while all open sores, with which these patients were affected, put on a much more healthy appearance than they presented previously to the employment of the solution. Early in 1848, the disease in a malignant form was again introduced to this establishment from one of the ships in the river; still by the constant use of the solution it was prevented from attacking other patients; even those with open buboes escaped, a circumstance so unprecedented as to lead to the conviction of the medical officer in its disinfecting properties.

In the Royal Marine Infirmary at Chatham, typhus fever, introduced from Ireland, appears also to have been held in check by its being freely used in the wards; and a similar result, it was considered, occurred on board the *Baretto Junior* transport, when crowded with troops on a passage to the West Indies.

The great benefit derived from the application of the diluted liquid to foul sloughing or cancerous sores, stands, however, on a more sure foundation. In the *Imaum*, it was used with the greatest benefit in the treatment of certain forms of ulcer. In cases of scrofulous ulcer, attended with an "overpowering odor," it was found in the hands of E. Wilson, Esq., to have the effect not only of removing the bad smell, but of promoting a healthy process in the sores.

In the case of a child afflicted with perforation of the intestine, it was of essential service.

In the city of Dublin Hospital its external application has been highly approved of.

I cannot conclude this letter without expressing my firm belief, that a more general use of an agent so innocuous in itself, and yet so powerful in the prevention of disease, is most urgently required in all hospitals or dwellings wherever typhus fever or other contagious diseases exist, as well as in emigrant ships, where it is at all times so difficult to enforce cleanliness, or dispel foul animal miasmata even by proper ventilation.

(Signed) W. BURNETT,
Director-General, &c.

"*Athol*," Woolwich, 1st October, 1848.

SIR:

I think it is my duty to acquaint you of a circumstance connected with the use of the chloride of zinc, which came under my observation during the passage of this vessel to Canada, and trust that its importance will form sufficient excuse for this informal method of detailing it.

On the 10th July last, two companies of Artillery, and a detachment consisting of 279 men, together with 17 women, and 39 children, were embarked at Woolwich, on board Her Majesty's troop ship "*Athol*," for a passage to Quebec. The children were all under 10 years of age, and appeared healthy and in good condition when brought on board: they continued so until the fifth day after leaving the river, when one of the number exhibited unequivocal symptoms of malignant scarlatina. So rapid was the progress of the disease in this instance, that scarcely thirty-six hours had elapsed before the child was dead.

While yet this case was under treatment, three others occurred in succession, presenting the same malignant characters as the first, and all with nearly the same degree of rapidity terminated in death. As might be supposed, the greatest alarm spread through the ship, nor could I refrain from sharing it, when I considered the number of people on board, and without having the means of isolating the sick from the healthy.

I had been made aware, previous to starting from Woolwich, that scarlatina was very prevalent in the garrison, but trusted the removal from the locality, and the salutary change to sea air, would go far to remove any danger which might spring from this circumstance. In this, however, I was disappointed.

On the fifth day from leaving, as above stated, the scourge broke out on board, and in a short time carried off four children. To check, if possible, its extension, and to mitigate its virulence, various measures were concerted by Mr. Combe, the

assistant-surgeon in charge of the troops, and myself, the chief of which were, free ventilation, and an abundant use of the solution of the chloride of zinc about the decks, sleeping berths and water closets, but more especially in the apartment occupied by the women and children. From the first day these precautions were rigorously enforced, the succeeding cases that occurred, amounting to only six in number, assumed a milder type, and all recovered, without exhibiting one untoward or serious symptom.

The voyage continued for fifteen days after the total cessation of this formidable disease; and the whole of the detachment, with accompanying females and remaining children, were landed safe and in good health at Quebec. To assert pointedly that the amelioration of the symptoms of the scarlatina, and its subsequent entire cessation, was a direct consequence of the use of the chloride of zinc, might be thought precipitate, yet I cannot dispossess my mind of the strong inclination it has to couple two facts together, and regard them in the light of cause and effect. But whether such inference be correct or not,—there stand the facts. In a vessel crowded with troops, women, and children, the last amounting in number to thirty-nine, none of whom had ever suffered from the disease before, scarlatina, of a malignant character, breaks out on the fifth day from leaving harbor,—the first four cases prove rapidly fatal, free use is then made of the chloride of zinc as a prophylactic, (and I will confess, more as a matter of duty, than with any very sanguine hope of its efficacy,) and immediately, the symptoms of the succeeding cases, only six in number, became so much milder, as scarcely to be characteristic in the last two cases of the disease; and on the twentieth day from its appearance, the disease entirely subsides, nor does a fresh case present itself during the fifteen subsequent days the vessel is at sea.

I have dwelt perhaps to an unnecessary length, in bringing under your notice the preceding facts; but the subject of disinfection is one of such importance, that I feel conscious no details will be regarded by you as either too tedious, or too trifling, which go to countenance the efficacy of any agent in producing so desirable a result.

I have, &c.,

(Signed)

ROBERT BEITH, M.D.,

Assistant Surgeon in charge.

'General Palmer,' Emigrant Ship, Cove of Cork, 3d October, 1848.

SIR :

With reference to your Circular, dated the 8th June, 1848, I beg leave to inform you, that I have availed myself of opportunities, on board the emigrant ship 'General Palmer,' to test the power of the chloride of zinc, both as an agent for destroying fætor, and as a disinfectant in cases of infectious disease. Twenty of the crew of the 'General Palmer' slept and messed in the fore-castle, a small, confined, and deep-sunk apartment, the deck over which was very leaky, the scuttles, that transmitted a glimmering light into it, were also leaky, which, together with the water taken down by the men's feet, kept the place almost constantly wet, and the moisture acting upon the matter in contact with it, occasionally gave rise to effluvia similar to the mingled fætor of the putrid and acetous fermentations: on those occasions, the deck, after being scraped, was mopped over with the diluted solution of the chloride of zinc, which removed the offensive effluvia in the space of a few minutes. Amongst the emigrants there were fifty-eight children, many of them very young; consequently disagreeable fætor was often unavoidable, and in the morning the effluvia from the sleeping-berths of the women and children was sometimes exceedingly offensive, but it was invariably removed in a few minutes by mopping the place over with solution of zinc. I may mention, also, that the Esquimaux in Hudson's Straits brought alongside the head of a walrus so offensively putrid as to produce a feeling of stupor, and pain over the forehead, but after it had been laved for a short time with the solution of the chloride of zinc from a sponge, the fætor was entirely removed, and it could be examined without producing any disagreeable sensation.

In the above instances the chloride of zinc removed the fætor, not by emitting any smell itself, but by destroying, or more probably by entering into chemical combi-

nation with the foetid gases, and that in a manner so unequivocal as to leave no doubt of its efficacy.

As a disinfectant, I tried the chloride of zinc in the case of one of the crew of the 'General Palmer' who was seized with modified small-pox a few days after we left England. The place where he lay, and his bedstead, were frequently washed over with the solution of chloride of zinc; and although there were more than thirty children who had not been vaccinated on board, the disease was not communicated to any of them: this, however, might be owing to there being no communication allowed between the patient and the other people on board the ship.

Whooping-cough was very prevalent among the children on board the 'General Palmer' when they landed at York Factory, Hudson's Bay, on the 21st August: immediately after they had left the ship, the lower decks and sleeping berths were washed over with the solution of chloride of zinc. Three days afterwards, a detachment of the 6th Foot embarked for Ireland with fourteen children, who had never been afflicted with whooping-cough; and although those children immediately occupied the sleeping berths that had been left by the pensioners' children laboring under whooping-cough, yet not a case of whooping-cough has occurred among them.

This, I think, affords presumptive evidence of the efficacy of the chloride of zinc in disinfecting the ship, after the whooping-cough patients had left her; but I must confess that I do not think it had much influence in preventing the disease from spreading among the emigrants' children who were exposed to intercourse with others laboring under whooping-cough.

I have, &c.,

(Signed) ALEX. MUIRHEAD,

Sir W. Burnett, K.C.H., &c. &c. &c.

Surgeon Superintendent.

Montreal, 29th February, 1848.

SIR:

In compliance with your request, I have pleasure in forwarding to you the following opinion of Sir William Burnett's disinfecting fluid.

I am not cognizant of any facts which enable me to arrive at a conclusion regarding the "disinfecting" properties which the name implies it to possess; and, ignorant of the nature and quality of the subtle element, to which, for convenience sake, we apply the term "miasm," developed by, and in its turn capable of generating fevers, I can offer no opinion as to any neutralizing agency which the chloride of zinc may exert upon it.

Of its deodorizing properties, however, I can speak from experience; and in this point of view, I consider it a valuable acquisition in the sick chamber, the addition of a small quantity of the fluid to the utensil, before recourse is had to it, effectually subjugating the offensive odor so commonly met with.

Equally beneficial will be found its use in apartments or places contaminated by offensive odors, caused by the elimination of sulphuretted hydrogen, or probably even phosphoretted hydrogen gases: its utility in these cases, as well as when employed to remove the disagreeable effluvia emitted by decomposing animal matters, as in subjects in the dissecting-room, is undoubted, being the result of a chemical decomposition mutually effected.

I regret that I had not an opportunity to put to the test its disinfecting powers during the months of May and June of the past year, when in professional charge at the Montreal General Hospital; the crowded state of the hospital, during the latter month especially, from cases of ship fever of the worst description, presented an opportunity of which I may not be again possessed. The fluid, however, had not at that time arrived in the country.

Yours, &c.,

(Signed) A. HALL, M.D.,

*Lecturer on Chemistry in Macgill College, and one of the
Physicians of the Montreal General Hospital.*

Dr. Stratton, Surgeon, R.N.

Extract from the Nosological Return of William Gramham, Esq., Surgeon of H.M.S. "Vengeance," between 10th October and 31st December, 1848.

"During the greater part of the month of December, the ship has been in Malta harbor, and the holds have been cleaned out and purified with the solution of chloride of zinc, which was injected into the well and every part of the ship below; the limber-boards were all taken up and washed with the solution, and the smell, which for months was very offensive, is now entirely destroyed. I am certain it was from the state of the holds, and the evolution of impure gases therein, together with dampness of the decks, which caused the sloughing ulcers in this ship; a man could not so much as receive the slightest scratch or cut in any part of his body without its turning to a sloughing ulcer, or within sixty hours causing an attack of erysipelas. Since the holds have been purified by the solution, wounds and injuries are cured without difficulty."

SIR:

H.M.S. "Adelaide," Sierra Leone, 30th September, 1848.

Having been appointed to the "Adelaide" tender, last June, I am enabled to testify as to the value of the chloride of zinc as a purifying agent. The "Adelaide" was, previously to being commissioned, a slaver, and had made several successful trips; consequently the peculiar effluvia of the slaves remaining in her was very strong and offensive; but whilst re-fitting she was well washed with the solution of the chloride of zinc, which effectually destroyed it before we were ready to leave Ascension: since then it has been repeatedly mixed with the bilge-water, the exhalations from which it has so completely neutralized, that even our silver remains untarnished.

I am, &c.,

(Signed)

FRANCIS C. SIBBALD,

Assistant Surgeon.

Sir W. Burnett, K.C.H., &c. &c. &c.

SIR:

"Unite," Convict Ship, Woolwich, 30th November, 1848.

The cholera having happily ceased, we feel it our duty to bring to your notice the advantage resulting from the use of the chloride of zinc, as a destroyer of all fœtid exhalations, and as one of the most powerful disinfectants with which we are acquainted. We used the solution in the "Warrior" and the "Justitia" with good effect, but it was in the hospital ship where we had the best opportunity of practically testing its great utility. This ship is remarkably well ventilated, and the chloride of lime has always been used; we therefore directed its discontinuance, and in its place used the zinc; we consider the advantages of the latter to be great and incontestible: it destroys all offensive effluvia more perfectly than the former, leaving the atmosphere around free from all unpleasant smell, while the chlorine from the lime is to many peculiarly offensive. One patient, laboring under abscess of the lungs, was so offensive, as to be scarcely approachable; the solution removed all odors, and so contributed to the patient's comfort, that he requested to be allowed to use it as a gargle, and to wash the surface of the body with it. He declared that he found great relief from its use.

The patients were allowed to have either the lime or the zinc, as they liked, to sprinkle the bedding and place in the close stools, but they invariably preferred the zinc, stating that the odor of the lime was offensive, but the zinc had no unpleasant smell.

So strong is our opinion of its utility as a deodorizing agent, that we shall never cease to use it on all occasions when an agent of that kind is required, and we recommend, most strongly, its general adoption in every department of the Convict Establishment. In the Naval Service it is properly appreciated. To the Mercantile Marine it would be invaluable; for when offensive smells arise from a hold which cannot be cleansed, the free use of the solution would remove all these, and at the same time preserve the woodwork of the ship, which we believe to be always undergoing decomposition, when noxious effluvia are evolved.

We are, &c.

(Signed)

G. H. DABBS, *Surgeon, R.N., Medical Superintendent, Woolwich Convict Establishment.*

EDWARD NOLLOTH, *Surgeon, R.N.*

FREDK. M. RAYNER, *Assistant-Surgeon, R.N.*

H. P. Voules, Esq., *Superintendent of Convicts.*

H. M. S. "Heroine," Plymouth Sound, 7th November, 1848.

SIR:

According to your desire, I have tried the solution of chloride of zinc in the following ways:—

1st. Both sides of the fore-castle were literally crammed with sick, most of them forced to use the bed-pan; the smell arising from the utensils, and also from their bodies, was intolerable—so much so, as very often to produce nausea. When I visited the sick, I used the solution, diluted as a wash, for the bed-pans and urinals, and hung up pieces of flannel dipped in the solution. The expression of the sick was, "that they were happy since I used the solution; and felt more comfortable."

During the prevalence of an inveterate itch, or crawleraw, those affected suffered the greatest misery, from an intolerable itching depriving them of all rest. I applied a very weak solution to the parts, which completely removed the itching, and expedited the cure.

The solution of the chloride of zinc I believe to be, from my limited experience, invaluable, as a destroyer of all noxious smells, and that it improves unhealthy and sluggish ulcers: as to its disinfecting properties, I cannot, with confidence, vouch for it; but I fancied that the fever subsided in a great measure during its use. The first opportunity that offers, I shall give it as extensive a trial as I can, and watch the results.

I have, &c.

(Signed)

JAMES WALSH, M.D., Surgeon.

Sir W. Burnett, K. C. H., &c. &c. &c.

Extract from the Journal of G. D. McLaren, Esq., Surgeon of H. M. S. "Belleisle," 1848.

"I now consider it my duty to speak of an agent to which the comfort and health of all on board the 'Belleisle' have in no small degree to be attributed—I allude to the solution of chloride of zinc.

"This ship having been employed for a period of two years and a half in the conveyance of troops to different parts of the world, will at once appear as having been peculiarly adapted for further proving the value of this solution.

"It was extensively used in different parts of the ship; but it was chiefly in the gun-room, where the women and children were actually located, and between decks, in bad weather at sea, when the air became replete with noxious effluvia, that its beneficial qualities were most striking. The most offensive odors were instantly destroyed by it, and the air made pure and refreshing. The employment of this valuable agent, combined with the necessary points of economy formerly mentioned, was certainly the means of adding much to the comfort, and consequently the efficiency of the ship, and no doubt it also had much influence in maintaining the health of the crew."

Extract of a Letter from William T. Kay, Esq., Royal Marines, Plymouth.

"In fever, much benefit has accrued from sponging the patients with a mixture of 1 part to 36 of water, three or four times a day, sprinkling the bed clothes with the concentrated solution, and steeping the linen of the patients in a mixture of 1 to 56 of water, before drying them. When affected with sordes on the teeth, a solution of 1 to 60 parts of water was employed advantageously to remove the fetor and incrustations. On the whole, it not only possesses the properties of a deodorant and disinfectant, but it is a most valuable therapeutical agent in the treatment of many of the most prevalent and troublesome diseases on board ship, where it occupies so small a space; in its concentrated force, it is always at hand as a valuable adjunct in the treatment of those diseases to which sailors are most liable."

Lord AUCKLAND has been pleased to grant Sir WILLIAM BURNETT permission to publish the following important document, relative to the use of the solution of chloride of zinc, as a sanitary agent.

Letter from Dr. LINDSAY, Deputy Inspector of Hospitals, R. N., to the Right Hon. the Earl of AUCKLAND, G. C. B., &c. &c. &c.

MY LORD:

London, 29th October, 1847.

When at Cove of Cork in September last, you did me the honor to request that I should make some notes regarding the use of Sir William Burnett's solution of

the chloride of zinc as a sanitary agent, as you said you were desirous of ascertaining its real merits. Having used it myself under a variety of circumstances, and having observed it extensively used by others in several of the public establishments for the treatment of the diseases of the poor in Ireland, I am satisfied that the following points have been fully established by experiments.

1st. In destroying noxious effluvia emanating from privies, cesspools, drains, sewers, and other receptacles of filth, the application of the diluted solution has been most successful. To ensure its full effect, the fluid must be brought into actual contact with the bodies from which the noxious smells emanate, and the more extended the surface to which the solution is applied the more speedy the result. In one very offensive privy and drain connected with it, in which I used the diluted solution, during the hottest part of last July, the noxious effluvia was entirely removed in less than half an hour; and although there was no further application of the fluid, the place remained free from any perceptible smell for more than a week.

2nd. In removing the noxious smells arising from the excretions of patients laboring under typhus fever, dysentery, and other diseases, and also from the offensive discharges of extensive sores, in cleansing the mouth and teeth during the progress of fever, and in correcting the smell of the breath and saliva in mercurial sore mouth, and speedily causing the gums to heal, it has been eminently successful.

3rd. In surgical practice it has proved of great value. In a case of gangrene of the foot extending up the leg, treated in the temporary Naval Hospital at Haulbowline, although the foot and part of the leg had been dead for many days before the part was removed by amputation, by surrounding the dressings with cloths wetted with the diluted solution, the putrid smell was completely subdued, much to the comfort of the patient, the attendants, and other persons in the same ward. In this case the gangrene was far advanced when your Lordship visited the hospital, I believe you did not detect any bad smell.

In a case of severe compound fracture of the leg in the civil hospital at Cove, where the discharge was very profuse and horribly offensive, the solution of the chloride of zinc was used with a similar result.

4th. In purifying the air of badly ventilated wards and apartments, where many sick persons were congregated together, and the atmosphere contaminated during the process of respiration, and by the exhalations from the skin, the air has been deprived of all disagreeable odor, and kept in a fresh condition, by constantly sprinkling the diluted solution upon the floors; and in some bad cases of fever and dysentery, upon the bedding of the sick. The patients have invariably expressed themselves as much refreshed by its use, and in many instances earnestly desired a continuation of it. The appetite was also restored in many cases where it had previously been destroyed by nausea arising from impure air, and thus far it has proved a valuable adjuvant in the treatment of disease.

In the present state of chemical science it is impossible to say what action the chloride of zinc has upon that entity called *miasma*, or the matter or matters formed during the progress of diseases of a decidedly contagious nature, and only known to exist in the secretions, and exhalations of the sick, from their power of transmitting disease from one individual to another; yet from its powerful effect in arresting the process of putrefaction, and destroying the noxious effluvia arising from animal and vegetable matters while in a state of decomposition (universally acknowledged to be a prolific source of disease) it is an agent of infinite value.

It is a well-known chemical fact, that hydrogen in a nascent state combines with many bodies with which it is in contact at the moment of formation, and carries them with it into the atmosphere. Sulphurated hydrogen is often formed under those circumstances, and in small quantity exercises a most deleterious influence on the health of man and the lower animals. When diffused through the atmosphere in a larger proportion, death itself often follows; more than one instance has occurred lately in London, where this latter effect was produced in a very short space of time. The energetic affinity of chlorine for hydrogen renders their existence in the atmosphere in a separate state impossible, and the reaction of the chloride of zinc on the gaseous compounds of hydrogen, and of ammonia, causes a mutual decomposition, by the combination of the chlorine of the one body with the hydrogen of the other, and thus neutralizes the noxious influence of the compounds of the latter.

I may also observe in conclusion, that the chloride of zinc being itself free of all unpleasant odor, and its metallic base quite innocuous, no injurious or unpleasant effect follows the use of it.

I have the honor to be,

My Lord,

Your Lordship's most obedient servant,

W. LINDSAY, M. D., *Deputy Inspector.*

The Right Hon. the Earl of Auckland, G. C. B. &c. &c. &c.

CHAPTER II.

CHLORIDE OF ZINC

As an Application to Ulcers with Offensive Discharges.

Extract from the Nosological Return of Dr. J. Sloan, Surgeon of Ascension Hospital, for May, 1848.

H.M.S. "Favorite" arrived here on the 1st instant, from the coast of Africa, having a number of cases of ulcer on board; eleven were sent to me for hospital treatment. I was not able to elicit any assignable cause for the prevalence of so many formidable ulcers, which, without a single exception, were confined either to the dorsum of the foot, leg, or heel. There appeared to me to be a feeble state of the nutrient vessels, as all the old cicatrized ulcers broke out. From all that I could glean, the men were not exposed to those exciting causes which are considered so essential to the production and development of ulcers. They had an unusually liberal supply of fresh meat and vegetables, and their clothing was carefully attended to, and report gives the "Favorite" the character of comfort and cleanliness.

The only complaints urged, were, the effects of climate, and that the white men having been brooming, some deleterious matter had entered the integuments; but this cannot be entertained, as two of the subordinate officers were affected who had not been so occupied: my own impression is, that there must have been some morbid condition of the atmosphere, which so vitiated their systems that the slightest scratch speedily degenerated into a well-defined ulcer, which progressed with alarming rapidity, in spite of the greatest attention.

The character of all the ulcers appeared nearly similar; they were for the most part ill-conditioned, with ragged, elevated, and discolored edges; they were covered by a reddish brown, or a grey slough, mixed with spots of blood, which was elevated considerably above the surrounding integuments. In one boy (Samuel L. Kinner, October 17) the disease extended nearly round the entire calf of the leg, and anteriorly it penetrated so completely as to denude the tibia: when the patients were landed, the sores were exceedingly tender, and in the poor boy above referred to, the slightest touch was followed by an oozing of blood—a thin acrid serum seemed to have taken the place of healthy pus, and the factor was exceedingly disagreeable: he suffered from a constant burning pain during the night, requiring large doses of

opium to procure rest, and relief from his sufferings. There was but little constitutional disturbance, nor was there any scorbutic taint discovered in any of them.

I placed them on their arrival in a detached ward, and they were each supplied with a basin and sponge. They had a liberal allowance of mutton, fish, and vegetables, with porter.

A solution of the chloride of zinc was at first employed, which had the effect, beyond my conception, of destroying the disagreeable factor, and it seemed to me to be the remedy whose action was most marked and efficacious in arresting the destructive process, and detaching the adherent sloughs when the ulcers were languid, showing but little tendency to granulate or cicatrize. I found it an excellent application. In some of the cases narcotics were found very beneficial in allaying the irritation and restlessness.

Extract from the Nosological Return of Daniel Ritchie, Esq., Surgeon of H. M. S. "Hecate," between the 1st July and 25th September, 1848.

"The cleanliness of the decks and every part of the 'Hecate' has been carefully attended to, and all disagreeable odors, immediately on their being perceived, at once and with complete certainty removed, by the use of Sir William Burnett's patent solution, when it was possible to effect its proper application. This was, however, rendered difficult and imperfect on our passage home, by the quantity of luggage received on board, and stowed away in the hold or between decks. The influences of putrid and hurtful emanations were also increased by the reception of a number of men, and above thirty invalids, three of whom were in the last stage of phthisis, and there was one with a sloughing ulcer, the putrid odor from which was at first excessively disagreeable and diffused. The free use of the solution to the decks and hold, and also to the ulcer, however, completely destroyed all offensive effluvia; and the ulcer, from rapidly sloughing to a great extent, and steadily resisting the remedial means employed, (circumstances which led the surgeon of Her Majesty's ship 'Howe,' and the invaliding officers, to characterize it as malignant.) was almost at once changed to a healthy suppurating sore, which healed kindly and rapidly."

Extract of a Letter from M. C. French, Esq., Surgeon of H. M. S. "Devastation," dated 11th September, 1848.

"In regard to the ship's economy, a week has scarcely passed without the chloride of zinc having been used for the purpose of purifying the well and bilges, the stench of bilge-water at times being so great as to produce nausea, but which was immediately removed on application of the chloride of zinc; and a glass of water taken from the bilges shortly afterwards was perfectly sweet and clear.

"In regard to the round-houses, I have, when the effluvia has been very offensive, used it with equal success, a slight application removing the unpleasant odor instantaneously.

"In several cases of ulcer, when other means have failed, I have found a solution of the chloride of zinc, 3ss to ʒj of water, succeed admirably; also in cases of gonorrhœa it has acted equally well as an injection, and in syphilitic sores, both primary and secondary, the application of it has succeeded in producing healthy action.

"I have now little hesitation in stating that the continued use of the chloride of zinc on board has in a great measure contributed to the health of the ship's company."

Sir W. Burnett, K. C. H., &c. &c. &c.

H. M. S. "Kestrel," Rio Janeiro, 21st June, 1848.

SIR:

I have the honor to inform you, that in compliance with the Admiralty Circular, to report on the efficacy of chloride of zinc as a disinfectant, that the only opportunities that have occurred on board Her Majesty's brig "Kestrel," have been in the cases of its destroying the factor of two ulcers, and also correcting the unpleasant

odor arising from the water-closets fitted on the lower deck of this vessel; in these cases it was perfectly successful.

I have, &c.

(Signed)

GEORGE EVEREST.

Sir W. Burnett, K. C. H., &c. &c. &c.

CHAPTER III.

CHLORIDE OF ZINC

As a Deodorizer, applied to Bilge Water, Foul Holds and Cellars, Cesspools, Vaults, Cabinet and Chamber Vessels.

THE Right Honorable the Lords of the Admiralty, having directed Sir William Burnett to cause the following facts relative to the action of the solution of chloride of zinc on bilge-water, and on certain deleterious gases extricated during the decomposition of animal and vegetable substances, to be made known throughout the naval service and to the public generally; it is proper to state, that it is not intended to claim for the solution any direct influence over the more subtle elements of which the contagion of febrile and exanthematous diseases is supposed to consist, although it yet remains to be proved whether it has or has not some controlling power over these; were presumptive proof admissible, evidence is not wanting to warrant the conclusion that it has, at least, a modifying influence. For the present, it is not deemed advisable to do more than to point out, by a selection of documentary evidence of a character hardly to be disputed, even by the most incredulous, that it is a fluid calculated above all others that have yet been discovered, to improve the sanitary condition of densely-populated localities, as well as to add to the comfort of all grades of society, whether in health or disease. In proof of this, it will not be necessary to resort to vague assertion; the facts which will be adduced to prove its action on known deleterious gases, and on what may be called the morbid or offensive animal miasmata, are explicable upon the principles of sound chemical philosophy, or at all events admissible on the grounds of the constancy of the results obtained from repeated experiments carefully conducted under the observation of men, the conscientious wording of whose documents sufficiently attests that their only aim in these investigations was truth. Nothing has been stated on bare theory, and nothing admitted until the premises were undeniable. It is, moreover, a consideration of no minor importance to know that the fluid being innocuous in itself, no evil consequences need be apprehended from its most abundant use,—a quality not possessed by several other substances and fluids employed for disinfecting or purifying purposes.

For the preservation of timber, canvas, and cordage, the chloride of zinc was first employed under patent in the year 1838, and is now in general use for that purpose in the principal Royal dock-yards and arsenals, as well as in many extensive private establishments; but it was not until a later period that the discoverer, Sir William Burnett, by the most simple process of reasoning, was led to suppose that as it acted as a preservative on these bodies, it would also arrest decay already begun. This by experiment was found to be the case, and further, as a necessary consequence, that the evolution of effluvia was also instantly arrested. To put this property, however, fairly to the test, some substances in a state of decay, together with offensive bilge-water, were obtained, to which, in separate portions, small quantities of the solution of various degrees of strength were added, and in every instance with the most satisfactory result. The effluvium was instantly and completely annihilated. These results were at the time considered curious, but not of the importance and utility which experience has since proved them to be. It was, nevertheless, not long before an opportunity offered for trying the experiment on a large scale, and, as may be perceived by the following notes, with the most perfect success:

H. M. S. "Hastings," Rio de Janeiro, 31st August, 1848.

SIR:

We beg leave to submit to you the following report upon the properties and efficiency of the solution of chloride of zinc, supplied for the use of Her Majesty's ship "Hastings," previously to her departure from England as flag-ship on the East India Station. The "Hastings" sailed from England on the 1st July, 1848, and before clearing the English Channel, encountered some rough weather; soon after which, a smell, of an unusually foul and unpleasant nature, began to arise from the pump-well, holds, and fore-cockpit. Several bucketsful of the solution diluted to the proper proportion, were poured down beneath the fore-cockpit close to the stem, and it was repeatedly and liberally distributed in the pump-well, but only with partial and temporary effect, for in twenty-four hours after each application, the effluvia returned with almost undiminished pungency, though the ship was regularly pumped out every morning, and the pump-well itself kept as dry as possible in the intervals, by having hanging stoves daily placed in it.

The lower tier of tanks, and the ballast which had been stowed in the hold several years before the ship was commissioned, have not been disturbed since, and it was probable that such an accumulation of various substances might have taken place around and beneath them during that period, as, combined with heat and moisture, could scarcely fail to generate effluvia of a highly offensive character, and afforded at least a very probable clue to the source from whence the smell emanated. On the 9th July last, a case of small-pox showed itself, which soon assumed the confluent form; the sick list, already amounting to 55, was daily increasing, and as it became imperatively necessary to leave no means untried that might tend to arrest the progress of disease, and improve the health of the crew, and seeing that little or no benefit had resulted from the previously limited application of the solution of the chloride of zinc, the surgeon recommended that it should be distributed through the interior of the ship, on the largest scale compatible with the quantity supplied to her, and with a due regard to reserving a portion for any peculiar contingency that might afterwards arise.

Two hundred and forty gallons of mixed fluid were accordingly (in the proportion of one part of the solution supplied to twenty parts of sea water) prepared, and previously to its application on the 14th July, the ship was pumped out, and the pump-well baled as dry as possible. The forcing-pump and fire-engine were used, and by their means the solution was forced into every part of the bottom of the ship, which it was possible to reach; the nozzle of the pipe connected with the hose having been first directed into every opening between the beams in the wings communicating with the limbers, and afterwards led through the fore-cockpit, and pointed under the floor of the fore-magazine. Two hundred and twenty gallons were thus disposed of, the remaining twenty having been poured round the step of the main-

mast. The good effects of its application not being obvious at first, five days were allowed to elapse before it was pumped out, and for five weeks subsequently, during the greater part of which period the ship was within the Tropics, and experienced various changes of weather, little or no disagreeable smell was perceptible—a result in our opinion, chiefly attributable to the application of the solution of the chloride of zinc.

We beg to express our decided conviction of its efficacy; and although various other means of ventilation were used simultaneously with the solution of chloride of zinc, we are of opinion that the improved condition of the lower parts of the ship, has been mainly owing to the employment of the latter.

(Signed)

We have, &c.

J. W. MORGAN, *Captain.*

J. H. COCKBURN, *Commander.*

R. T. C. SCOTT, *Surgeon.*

Sir W. Burnett, K. C. H., &c. &c. &c.

H. M. S. "Spy," Ascension, 29th November, 1848.

SIR:

In compliance with the directions issued by you, to report on the chloride of zinc, I beg leave to state the following:—

On lifting the scuttle of a small store-room beneath my cabin, on the 1st November, a most insufferable effluvia immediately arose, and disseminated itself throughout the vessel.

On search being made, the cause of it was discovered to be the bursting of a case of preserved meat, and the escape of its contents, which, from exposure to air, had become putrid.

It immediately occurred to me that it would be a favorable opportunity of trying the chloride of zinc, and, after the store-room had been thoroughly cleaned, I used it in the manner directed by the pamphlet. In about twenty-four hours, the effluvia had entirely left the lower deck, and in five days was imperceptible in the store-room itself.

Of the powers of the chloride of zinc, as a deodorizing agent on this occasion, all the officers on board were fully convinced.

(Signed)

I have, &c.

GEORGE WILLES, *Assistant-Surgeon.*

Extract of a Letter from Dr. W. Loney, Surgeon of H. M. S. "Amphitrite," dated 2nd September, 1848, from Ascension.

"I have the honor to enclose you Captain Eden's testimonial of the usefulness of the solution of chloride of zinc as a disinfecting agent; and I would add, that its easy and simple application, together with its perfect freedom from the strong and disagreeable smell of chlorine, which attended the old process of purification by the evolution of that gas, ensures it a readier application on board ship than it would otherwise meet with, which, for obvious reasons, is no small recommendation."

ENCLOSURE.

H. M. S. "Amphitrite," Ascension Roads, 1st Sept. 1848.

I hereby certify, for the information of the Lords Commissioners of the Admiralty, that the chloride of zinc solution has been regularly used on board the "Amphitrite," in conformity with the instructions accompanying the supply, since the 1st May last, and with the best results.

The offensive smell of sulphuretted hydrogen from the bilge, which existed previous to this date, ceased altogether after the first few applications, and to the regular use of this deodorizing agent, I feel warranted in attributing the continued total absence of all noxious effluvia.

(Signed)

THOMAS RODNEY EDEN, *Captain.*

Extract from the Nosological Return of Thomas Kincaid, Esq., Surgeon of H. M. S. "Helena," between 1st August and 1st September, 1848.

"The ship was fitted out so hurriedly, that there was no time to unstow the ballast and clear the bilges; in fact, it is doubtful whether the ballast has been unstowed, or the bilges cleared, since the vessel was last in commission. When we got to sea, the bilge-water was stirred up by the motion of the ship; the stench arising from it was most intolerable, worse than I have ever experienced from such a source in my life. Sir William Burnett's solution was employed to remedy this with the most perfect success. A quantity of the solution, mixed with salt water, in the prescribed proportion, was poured down the pumps and introduced into the bilges; the lower deck was thoroughly cleared, and the solution applied to every part of the deck; the store-rooms were also sprinkled.

"The stench, which before was utterly insupportable, was entirely removed, and since the application of the solution, the vessel is completely freed of all unpleasantness arising from the smell of bilge-water."

Brig "Thames," Liverpool, 8th February, 1849.

SIR:

I have much pleasure in reporting having used Sir William Burnett's disinfecting fluid, according to your directions, a jar of which you sent me on board for the purpose of trying its effects in purifying bilge-water, and neutralizing the nauseous effluvia arising from a cargo of hides and tallow, on my homeward voyage from Buenos Ayres.

I found it completely to maintain the character you gave me of it before leaving England. By using it occasionally, whenever the smell became disagreeable, it completely removed all causes of complaint, and rendered the ship sweet. From having noticed these good effects, I strongly recommend its use for such purposes on board vessels.

I am, &c.

(Signed) JOHN S. RUTHERFORD,
Owner and Commander of the Brig "Thames."

The Secretary of Sir W. Burnett's Patent.

Extract from the Journal of James Allan, Esq., Surgeon of H. M. S. "Juno," between the 1st October, 1848, and the 4th February, 1849.

"There have been 114 cases under treatment, 111 of which have been cured on board and two sent to hospital. This extremely low ratio of mortality has, however, another important feature; it also shows the total suppression, and disappearance of certain forms of zymotic disease, which almost constantly existed in the ship from the time she was commissioned in September, 1845, till September 1848. From the different returns transmitted during that period it will also be collected that these diseases prevailed to the greatest extent, and in the most aggravated form, among the men who were employed in and about the holds, not one of whom escaped an attack of fever. With respect to the cause, or causes of these fevers, it may be stated, that, (especially while serving on the coast of Mexico,) the patients had been subjected, from the peculiar nature of their duty, to great bodily fatigue at a very high temperature, and, for at least twelve out of every twenty-four hours, I have no doubt breathed a highly vitiated atmosphere; for notwithstanding the greatest attention to ventilation, whitewashing, cleanliness, and the use of chloride of lime, the effluvia of bilge-water emanating from the holds was frequently almost intolerable. Whether this was the sole cause of the fevers, or that by its sedative action it only promoted the absorption into the system of other deleterious gases produced by the decomposition of organic remains, and not perceptible to the sense of smell, (for malaria, though frequently, is not always or necessarily, associated with stench,) it is at present difficult, if not impossible, to determine.

"Whatever may have been the nature of the cause, there can be no doubt that it was generated in the holds, and (from the proofs already stated of its noxious activity) consequently that it existed there in a more concentrated form than elsewhere. These are the principal facts connected with the sanitary condition of the ship up to the 30th September, 1848.

"Early in the following month, a supply of the solution of chloride of zinc was procured, the use of which not only completely annihilated the offensive emanation formerly complained of, but fever has also disappeared, not a single case having occurred during the whole period of this journal, even among those men who were formerly so obnoxious to its attacks.

"As the influences of climate, diet, clothing, discipline, cleanliness, ventilation, &c., have been essentially the same during the last three years, no reasonable person can, I presume, arrive at a conclusion very different from that already submitted in a previous report; and which, further experience has tended to confirm—that to the invaluable deodorizing and disinfecting properties of this agent, the surprising improvement in the health, and consequent efficiency of this ship's company, was principally, if not solely, attributable."

PURIFICATION OF BILGE WATER, &c.

"Oriental" Steam Ship, 30th December, 1841.

SIR :

In reply to your note respecting the preparation of Sir W. Burnett for cleaning the vessel from bilge-water, I beg to say, we tried the mixture on the last voyage, and I am of opinion that we are much better now, as I never have perceived any effects of bilge-water on the passage home; whereas previously everything on board was discolored, to the silver in our pockets and watches, which turned quite blue. I am not prepared to say that it arises solely from using the preparation, but will acquaint you on some future occasion, as I intend making further use of it.

I am, &c.,

(Signed) J. SOY, *Commander of the "Oriental."*

To Lieut. Kendall, R. N., Marine Superintendent,
Peninsular and Oriental Steam Navigation Company, &c.

From the late E. N. Kendall, Esq., R. N., formerly Superintendent of the Royal Mail Steam-Packet Company's Vessels.

*Peninsular and Oriental Steam Navigation Company's Offices,
57, High Street, Southampton, 4th March, 1844.*

MY DEAR SIR :

I regret to say that the "Oriental" sailed on the 1st instant, the date of your note. I was unable to obtain from Captain Soy that which I know he would have been ready enough to grant, namely, a further testimonial as to the efficacy of Sir William Burnett's preparation in destroying, or rather neutralizing, the offensive effluvia from bilge-water; but I can myself afford the most ample testimony to the fact, not only in the "Oriental," but in other vessels in the Company's employ, where the experiment has been made with the happiest results; so that I have no hesitation whatever in recommending its application, not only for the purpose of purification, but because of its preservative properties, of which I am more and more convinced by experience.

In 1844 it was further employed under peculiarly interesting circumstances. The Royal yacht, from the intolerable stench which issued from her holds, particularly when under weigh or in motion when at anchor where the water was not perfectly smooth, had become almost uninhabitable, while every attempt to get rid of the nuisance had proved abortive. The introduction of the chloride, therefore, although spoken of by many at the time as chimerical, was recommended, and tried; with what success the following reports, made to Rear-Admiral Hyde Parker, will best show :

Portsmouth Dock Yard, 14th July, 1847.

SIR :

Agreeably to their Lordship's directions of the 9th instant, I have called upon the heads of the respective departments to report the effect of Sir William Burnett's fluid, when used for the removal of noxious smells, &c., and enclose their reports for their Lordship's information.

I am, &c.,

(Signed) HYDE PARKER, *Admiral Superintendent.*

Henry George Ward, Esq., &c., &c., &c.

SIR :

Portsmouth Yard, 14th July, 1847.

With reference to your memorandum of the 12th instant, respecting the application of Sir William Burnett's solution as a disinfectant, we beg to report that the fluid was used in 1844 with that view on board the Royal yacht "Victoria and Albert," in consequence of the noxious effluvia from bilge-water, and the remedy was then and subsequently found to be very effectual. The solution has also been successfully applied under similar complaints on board several ships in ordinary, and we therefore consider that its more general adoption in the navy would not only conduce to the comfort of the people, *but might also tend to the preservation of the ships.*

We are, &c.,

(Signed) JNO. FINCHAM, *Master Shipwright.*
W. M. RICE, *Assistant ditto.*

To the Admiral Superintendent.

Portsmouth Dock Yard, 14th July, 1847.

Submitted for the information of their Lordships, agreeably to directions of the 9th instant.

(Signed) HYDE PARKER,
Rear Admiral.

Her Majesty's Dock Yard at Portsmouth, 14th July, 1847.

SIR :

In reply to your memorandum of the 12th instant, wherein I am directed to report the effect of Sir William Burnett's fluid when employed for the removal of noxious smells, such as bilge-water, or when employed as a disinfectant, if such has ever been the case; I beg leave to inform you, that I witnessed its application in February, 1844, for the purpose of removing a more than ordinary stench, of bilge-water and other offensive odors in the "Victoria and Albert" Royal yacht, with most complete success. I am informed by the carpenter that she has remained comparatively sweet ever since, and when a bilge-water smell is occasionally perceptible, a slight application of the fluid removes it.

I have heard from some of the officers thereof that it has been used with remarkable benefit in several ships in ordinary for the same purpose.

I have ordered it for very disgusting privies, the effluvia from which it quickly neutralizes.

I have employed the fluid in a severe case of open cancer, the factor from which was intolerable to the patient and attendants; this it destroyed so long as the dressings were kept moist therewith.

I have witnessed the use of, and employed the fluid as a preservative of specimens of morbid anatomy, and found it just as good as spirits of wine.

I have tried various experiments on a small scale, on noxious gases and offensive odors, with, in every instance, perfect success, from which, and the efficacious results in the before-mentioned instances, there can be no doubt of the fluid possessing potent powers as a corrector of noxious and disagreeable odors; moreover, if sufficiently applied, and kept for a short space of time, so as to permit the timber to imbibe some of it, I am convinced that the fluid will not only correct the bilge-water smell, but have a resisting effect to its future formation.

I have, &c.,

(Signed) JAMES HENDERSON,
Surgeon.

Hyde Parker, Esq., C. B., Admiral Superintendent, &c. &c. &c.

Portsmouth Dock Yard, 14th July, 1847.

Submitted for the information of their Lordships, agreeably to direction of the 9th instant.

(Signed) HYDE PARKER,
Rear Admiral.

Portsmouth Dock Yard, 13th July, 1847.

SIR :

With reference to your memorandum of this day's date, directing me to report on the effect of Sir William Burnett's fluid, when employed for the removal of noxious smells, such as bilge-water, or when employed as a disinfectant;

I beg to state that when serving as master of Her Majesty's ship "Trafalgar" in 1815-6, it was frequently used for destroying the effects of bilge-water, and that it was highly approved of.

I am, &c.,

(Signed) C. P. BELLAMY,

The Admiral Superintendent.

Assistant Master Attendant.

The fluid having been subsequently tried in several others of Her Majesty's vessels, the following reports were obtained, and are here submitted in proof of its value as a means—when properly used—of effectually removing one of the greatest annoyances experienced on board ship, but more particularly in steam vessels, whether arising simply from bilge-water or from a foul state of the holds.

From the Hon. Captain Plunkett to Sir Hugh Pigot.

H.M. Steam-Sloop "Stromboli," Clifden, 21st January, 1845.

SIR :

In pursuance of an order from the Lords Commissioners of the Admiralty, I have to report upon Sir William Burnett's solution supplied to the "Stromboli" in August, 1844.

Previous to any application of the solution a very powerful smell, arising from bilge-water, and producing in some people sickness at stomach and headache, was from time to time experienced.

Upon such occasions the bilges were cleaned out, dried, and whitewashed, but without the effect of destroying the smell, which still recurred in wet weather, and when the ship had much motion. Since August last the solution has been used in the proportions directed by Sir William Burnett, and each time in increased quantity, the first trial not proving effectual. Upon the last occasion, on the 16th of December, 15 pounds of the solution were used with 54 gallons of water, and from that time to the date hereof, no further inconvenience has been experienced from the bilge-water, and the health both of officers and ship's company has been very good.

I have, &c.,

(Signed) E. PLUNKETT,

Commander.

Rear Admiral Sir Hugh Pigot, Knt., C.B., K.C.H., Commander in Chief.

"Amazon," at Cork, 7th February, 1845.

Forwarded for the information of the Lords Commissioners of the Admiralty.

(Signed) H. PIGOT,

Rear Admiral.

H.M.S. "Stromboli," Clifden, 22nd January, 1845.

DEAR SIR :

I have this day reported officially on your solution, and I am sure you will be the better satisfied with my report that it was not made hastily, or with insufficient trial. I waited until now, even after the last trial had freed us from that most sickening smell which we used to complain of, to see how long a time would elapse before another application was necessary; but as we still remain free from inconvenience, I do not like to delay my report. The uncertain recurrence of the smell had made it doubtful at first how far the evil was remedied; but as 35 days have

now elapsed, with every change of weather and circumstance calculated to test the experiment, and it still succeeds, I think it decisive, and can only say, if Government did not allow the solution, I should provide it myself.

Pray believe me, &c.,

(Signed)

ED. PLUNKETT,

To Sir W. Burnett, K.C.H., &c. &c.

Captain R.N.

Extract of a Letter from Mr. Robert Grigor, Assistant Surgeon of the "Stromboli."

The last three trips we made, we had very bad weather and a tremendous sea running; yet, with all my diligence, I could not perceive the least smell of bilge-water in any part of the vessel. Previous to using this solution, it was almost impossible to remain below when at sea.

You will observe, that when in harbor, lying quietly at anchor, we never suffered much inconvenience from this same bilge-water; but the very instant we got under weigh, especially if there were any sea, we were glad to betake ourselves to the quarter-deck; there is no longer any necessity for this.

Her Majesty's Steam Vessel "Porcupine," Woolwich, February 27, 1846.

SIR:

Having yesterday proceeded on board the "Eclair," and examined her minutely in every part, not the slightest disagreeable odor could be detected; but on the contrary, a pleasant, wholesome, and reviving smell of chlorine gas, evolved from the solution, which appeared to have been plentifully used; and although the bilge-water has remained for a considerable number of days in her holds without being disturbed, and would, under ordinary circumstances, have become very fetid and disagreeable, not a vestige of any unpleasant smell existed. I obtained some bilge-water from the holds, which had not only been purified in smell, but in color also.

I have further to inform you that your solution has been applied to the holds of the "Porcupine" (in which vessel I have the honor to serve,) and although a very short time has elapsed since its application, the disgusting effluvium which previously existed is now entirely removed; indeed, its effects appear to be instantaneous, for, on the morning after applying the solution, not the slightest fætor existed; and, as a further proof of its perfect success, plate, gold lace, and other metallic substances, now retain their color and brilliancy, which before could never be kept from tarnishing—evidently showing the corrosive principles are also removed; but, above all, the health of the ship's company has already improved, and their comfort has been much enhanced by the removal of the deleterious and highly offensive effluvia which were emitted previous to the application.

I have, &c.,

(Signed) R. P. CHAPMAN,

Assistant Surgeon.

To Sir W. Burnett, K.C.H., &c., Director General of H.M. Navy.

Extract from a Letter from Captain F. Bullock, R.N., commanding H.M. Steam Vessel "Porcupine," dated Woolwich, 30th March, 1846.

The "Porcupine" is still as sweet as a nut, and I congratulate you upon the success of the patent, for its effects were really magical, and seemingly durable. It was, however, a formidable affair, I can assure you, and caused us some bad sick head-aches. We shall watch this process narrowly, and will make you a prompt report by-and-by.

Ever faithfully, &c.,

(Signed) FREDERICK BULLOCK.

Extract from the Journal of Dr. F. Mansell, Surgeon of H. M. Ship "Collingwood," between 8th March, 1844, and 1st July, 1845.

The holds and well have not been neglected, and occasionally, whenever any smell of bilge-water has arisen in the latter, I have placed a quantity of chloride of

zinc in it, with the greatest benefit, as in a few minutes after this operation no smell is perceptible.

Dr. McWilliam to the Secretary of the Admiralty.

3, Oakley place, Southsea Hants, 17th September, 1846.

SIR :

I have the honor to enclose a certificate from Commander Gallway and the officers of H.M.S. "Rapid," relative to some experiments which I made on board that ship, to destroy the offensive smell of bilge-water in the hold, by means of Sir W. Burnett's patent solution.

The result was quite satisfactory, after a fair trial was made. On the first occasion the experiments failed, owing to the flow of the solution into the pump-well being stopped, by an accumulation of various matters under the limber-boards. On this being removed, and the solution allowed to pass into the pump-well, the success was most convincing and complete.

I am, &c.,

(Signed)

J. O. M^CWILLIAM, M. D.

Surgeon, R. N.

"We, the commander and officers of Her Majesty's sloop 'Rapid,' have witnessed experiments made by Dr. J. O. McWilliam, to test the efficacy of the Burnett solution in destroying the disagreeable odor arising from bilge-water in the hold of this vessel.

"The 'Rapid' experienced very bad weather in the passage from Plymouth to Madeira during February, and the early part of the present month. The bilge-water smelt most offensively, particularly from the air-holes in the gun-room cabin.

"On two occasions since that time the solution has been employed; the last time it was used the pump-well was thoroughly dried, and the solution was forced, by means of a small engine-pump, under the limber-boards in the fore part of the ship, and ascertained to flow aft into the pump-well.

"It was also forced through the air-holes to the sides and lower parts of the ship. The result is, that there is now no smell of bilge-water in any part of the ship; on the contrary, she seems everywhere quite sweet and clean.

(Signed)

H. J. W. S. GALLWAY, *Commander.*

W. G. FISHER, *Senior Lieutenant.*

W. H. BALLERTON, *Master.*

EDWARD HEATH, *Surgeon.*

G. J. STARR, *Paymaster and Purser.*

W. M^CCLUNE, *Master's Assistant.*

EDMUND GLYNN, *Lieut., taking passage."*

Relative Merits of the Chloride of Zinc and Chloride of Lime as tested in the "Lord Auckland" Convict Ship. Extracted from the Journal of the "Lord Auckland,"—March, 1847.

The chloride of lime I have always used very extensively, and although it has counteracted disagreeable smells by creating one of its own, I have never found it so beneficial or lasting in its properties as the chloride of zinc. In the first place, the effluvium arising from the former application is anything but pleasant; and, so soon as the smell of chlorine has ceased to pervade the apartment, I have invariably found that the noxious smells become as prevalent as ever; indeed, a few hours after its use, we have had the disagreeable smells from the closets descending the prison-deck; and although used twice a day, morning and evening, and then scrubbed into the wood-work and left wet with the liquid, it has not been a sufficient safeguard against the strong urinous and other smells from the round-houses.

With the chloride of zinc there is no unpleasant smell whatever from its solution; it not only eradicates the fœtor from close and confined places, but produces a sweetness and an agreeableness of the air between decks; the lasting properties of one

application keeps everything pure for full 48 hours, which I could never obtain by the chloride of lime. And although I have been in the habit of using both remedies in different vessels, even before the application of the latter (chloride of zinc,) at the appointed time in the morning, we seldom or ever found any unpleasant smell to warrant such a washing or sprinkling; but with the former (chloride of lime) its effects were gone in a few hours.

(Signed)

BENJAMIN BYNOE,

Surgeon, R. N.

Extract from the Journal of P. Slevin, Esq., Assistant-Surgeon of H. M. S. "Thetis," (1847.)

The only particular cause to which I can assign (with any degree of plausibility) the origin of this fever, may be attributed to bilge-water effluvia; after the removal of which, by the free use of chloride of zinc, the cases of fever evidently subsided. Whether this arose from other causes than that which I have stated, I am not prepared positively to say.

Extract from the Nosological Return of Mr. Thomas Gibson, Surgeon of H. M. S. "Eurydice," between 1st October and 31st December, 1846.

One of the cases of ulcer had an angry sore; the chloride of zinc was had recourse to, in the proportion of one part to four of water, which produced an eschar, and on suppurating the ulcer assumed a healthy appearance, continuing to improve under a very weak mixture of the chloride of zinc and water.

The economy of the ship has been to keep between-decks well aired by wind-sails, the decks cleaned by dumb-scraping, keeping the pump-well sweet by pumping it out dry twice in the 24 hours, and occasionally introducing a portion of the chloride of zinc, which had a most marvellous effect in removing and destroying the offensive effluvia of bilge-water; also seeing that the crew have proper clothing in night-watches, and in wet weather.

In addition to the above remark on the usefulness of the chloride of zinc, I may observe, that on the "Eurydice" joining the channel squadron, after being recommissioned in August last, the smell of bilge-water was very offensive, proceeding from the pump-well, and from the hold on being opened. Solution of chloride of zinc, according to the instructions of the director-general of the medical department of the navy, of 22nd January, 1846, was thrown down the pump-well, previously dried. On being pumped out, the well and hold became sweet; the carpenter of the ship, who had been in her during the previous commission, expressing himself surprised, and remarking that the smell of bilge-water was always in the ship, and could never be got out of her till now; also I may observe, that on the passage out, on the pump-well becoming somewhat offensive, I called the attention of Lieutenant Mends, (senior lieutenant of the ship,) Dr. S. J. Graham, and Mr. Charles T. Kevern, supernumerary surgeons for the African squadron, to the state of the water on being pumped out, and previous to the introduction of the solution. The following evening, on examining the pump-well and water pumped from it, to their agreeable astonishment, both were found free from the offensive effluvia of bilge-water.

"Sirius" Steam-ship, London, February 16, 1846.

DEAR SIR:

I consider it a duty I owe to Sir William Burnett to state to you, that his solution has been tried in this ship, under my command, with the greatest possible success, for doing away with the noxious smell of bilge-water,—so disagreeable at all times to passengers and other persons on board. At one time, such was the offensive smell, that no person could remain long in the cabin without having the ports up and stern-windows open—not always available in bad weather; that since using the above solution it has completely done away with every bad smell of the kind; and that I do strongly recommend every ship-master never to be without a

quantity of it on board for sweetening his vessel. It has my decided approbation, and you are quite at liberty to make use of this letter in any way you may deem fit, as an inducement to all and every person afloat to make use of this invaluable cure for all purposes that may be necessary to sweeten his vessel.

I am, dear Sir, your very obedient servant.

(Signed) I. MOFFATT.

To C. Jackson, Esq., &c. &c.

From W. F. Daniell, Esq., to Sir William Burnett.

London, September 15, 1847.

I am happy to state that during my recent residence in S. W. Africa, I have derived great aid and advantage from the use of your solution of the chloride of zinc, not only in removing the fetid and offensive smell of the bilge-water, to which all merchant vessels are liable more or less, but also in preserving the wooden framework of the European houses from the depredations of numerous insects and worms which in particular destroy those portions embedded in the soil. Timber once immersed in this solution, even for a brief period, appears to be exempt from most of the ill effects of an African climate. The factories, therefore, become more durable, and hence one great source of expense in their continual re-erection is thus avoided. In a hygienic point of view, I am much indebted to its utility when sufficiently diluted, by applying it in the form of a bath to the skin, and I can assure you not only myself, but most of the men under my charge who have been obliged to reside in unhealthy localities, concur in giving it a high character, from the decided benefit which has resulted from its regular employment.

I remain, my dear Sir William, yours ever sincerely,

(Signed) W. F. DANIELL.

Sir W. Burnett, K. C. B., &c. &c.

Extract of a Letter from E. Elliott, Esq., Assistant-Surgeon, R. N., to Sir William Burnett.

The "Vanguard," "Albion," and "Rodney," were all at Malta during the greater portions of February and March of 1847. The two latter were cleared out, and thoroughly calked, but the after-hold of the former was only cleared, which was well swept, dried, and then thoroughly imbued with the solution of chloride of zinc, used according to the directions, so that it might come in contact with the whole of the surface, and the remainder of the proportion supplied was injected by means of the fire-engine, through the skin of the vessel into every part, fore and aft, and would consequently be applied to a large proportion of her timbers, as well as under the lining, about the keelson and wells; but this course was not pursued in either of the other vessels; in the "Albion," a small quantity was simply sprinkled in the after-hold, and in the "Rodney" I could not learn that it had been used at all, or, if so, not sufficiently to produce any good results.

All these vessels sailed about the end of March for the coast of Greece, and were employed there, and among the Greek and Ionian Islands, until their return to Malta early in October. During this period they were exposed similarly to the same causes; in neither was leave given to the ship's company, by which any diseases might have been introduced or originated from intemperance while on shore; and almost the same discipline was observed;—they had all been upwards of two years in commission, and nearly similar hygienic rules respecting the cleansing of decks were observed in each; and yet the comparative immunity which the "Vanguard" enjoyed from disease, and the small number of her sick list, was the general subject of remark among the medical officers of the fleet. She was not more roomy or better ventilated than any of the others, indeed perhaps less so, as they had each a scuttle abaft the mainmast, through which a windsail passed to the after-hold, which she had not; all were equally crowded with supernumeraries, yet on going on board either of them there was a marked difference in the sweetness of the ships below, and their freedom from unpleasant smells.

In both the "Albion" and "Rodney," the effluvia from the after-holds, which contain salt provisions, was very disagreeable, and the smell of the bilge-water ren-

dered the cock-pit cabins scarcely habitable to the officers, blackening not only the white paint, but tarnishing gold lace. The diseases which occurred in these vessels assumed a more severe type, especially on board the "Rodney," and the numbers on the sick list of each were generally double that of the "Vanguard." Now to what can this immunity and this difference be attributed? After much reflection on this point, and viewing it in all its bearings, I can come to no other conclusion than that the chloride of zinc, used as it was in the "Vanguard," must have produced some effect, and is entitled to its full share of credit in contributing to this singular freedom from those diseases which may originate from effluvia, arising either from stagnant water, or the evolution of deleterious gases during the decomposition of animal or vegetable substances in the holds of ships.

I have the honor, &c. &c.,

(Signed) ERNEST ELLIOTT.

To prove the correctness of the statements made in the preceding letter, the reports from the "Rodney," "Albion," and "Vanguard," were referred to, and the comparative rate of sickness found to be as follows:—

*Department of the Director-General of the Medical Department }
of the Navy, 17th January, 1848. }*

A Comparative QUARTERLY STATEMENT of the SICK of the following Ships, extracted from the Nosological Returns received into Office during the Year 1847.

Ships Names.	Number Sick.			Total Number Sick during 9 months.	Of diseases frequently influenced by causes within ships of war, there occurred on board the under-mentioned as follows:			
	Lady Quarter, 1847.	Mid-summer Quarter, 1847.	Michael-mas Quarter, 1847.		Fevers.	Erysipelas.	Rheumatism	Ulcers.
Rodney,	243	194	279	716	55	11	37	40
Albion,	156	210	204	570	48	2	33	42
Vanguard,	155	146	113	414	6	2	22	24

B. P. HOBART.

Letter to Sir Gordon Bremer.

Dock-yard, Woolwich, November 10th, 1847.

SIR:

I beg leave to acquaint you with the result of the application of the Burnett solution on H. M. S. "Fisgard."

The condition of this vessel afforded a very favorable opportunity of testing the powers of this disinfecting agent. A truly nauseating effluvia pervaded the whole of her interior, produced chiefly by the presence of sulphuretted hydrogen gas, consequent upon the liberal use of sulphur employed in smoking out the rats; so distressing were the effects of this gas, that almost all at work in her suffered from headache and sickness. The chloride of zinc was accordingly used, but only to a moderate extent; within a short space of time, not a trace of unpleasant odor was perceptible, and the ship became perfectly sweet and wholesome.

I am, Sir, your very obedient servant,

J. N. DERRIMAN, M. D.,

Assistant Surgeon.

Commodore Sir Gordon Bremer, Superintendent.

The complete control which the solution has over the elimination of offensive effluvia from bilge-water, or other accidental matters decomposing in the holds of a ship, having been clearly ascertained by the preceding experiments, and numerous

others of a similar nature, it is now used generally in all Her Majesty's vessels, instead of the chloride of lime.

To obtain a substance harmless in itself, and free from smell, but possessed of the property of destroying all other smells, particularly such as are offensive or injurious to health, has long occupied the attention of scientific men, more especially such as were interested in the health, comfort, and longevity of that part of the community compelled to reside in densely-populated towns; but until this solution was brought into use, it may be safely asserted that no such boon had been extracted from the secret stores of nature. Under this privation we had become accustomed to the employment of various things that are not only ineffectual, but in a large majority of instances positively obnoxious to the senses, detrimental, and it may even be asserted, occasionally dangerous to health. Such for instance, are the fumes of corrosive gases, which from their irritant effect on the delicate bronchial tissue, can never be breathed without considerable risk by those who have either actual disease of the lungs, or a predisposition, from whatever cause, to disease of these organs. These gases, or at all events, chlorine gas, are in other respects highly objectionable from the injury they occasion to the better sorts of furniture. The well known bleaching properties of chlorine render it totally inapplicable where there are tissues consisting of silk, cotton, or wool of delicate dyes. The colors it would instantly destroy, and if used to a moderate extent, it would even act upon the fabric itself.

Chloride of lime was at one time extensively used as a fumigating or disinfecting agent, both in the chambers of the sick, and for the dispersion of foul odors in close places, but without the slightest advantage. The same objections in a modified degree apply to it as to the former; it has therefore of late been almost entirely discarded from use within doors; the smell arising from it being moreover to many people more insufferable than those it has been required to correct; particularly as it only partially covers other effluvia, without in the least degree destroying them or preventing their evolution; it thus becomes an aggravation of the evil sought to be got rid of. The smell of vinegar, although grateful and refreshing, yet when mixed with the tainted air of a sick chamber, or the wards of a hospital, where offensive animal effluvia are seldom altogether absent, is exceedingly disagreeable and sickening. Equally offensive, if not more so, is the smell from burning rags; a mode of fumigating that has too frequently been resorted to from a want of other means in the humbler walks of life.

Pastiles, although they are seldom burned in the presence of the sick, are not unfrequently made use of to overcome offensive odors,—the principle in fact on which nearly the whole of these articles have been used, and the only advantage they are capable of affording.

Considering the acrid poisonous nature of several substances with metallic bases, the introduction of secret chemical compounds for purifying the wards of hospitals, and the dwellings of the poor, cannot be too strongly repudiated, at least by medical men; yet a preparation of lead, one of the most obnoxious of the metals as regards health, with which we are acquainted, but which possesses considerable destructive power over certain mephitic gases, has been proposed for general use as a disinfectant. Whatever its properties may be in this respect, and it is assumed they are not great, there are few people acquainted with the danger of sleeping while in sound health in a newly-painted room, that would consider the diffusion of the vapor of a solution of one of the salts of that metal in the wards of a hospital, anything but a very dangerous and an unwarrantable procedure. As the vapor of the preparations of mercury, when diffused in the atmosphere, will speedily produce the specific effects of that mineral on those exposed to them, so it is submitted under every precaution will those of lead produce its specific effects, namely, obstinate colic, paralysis, and permanent decrepitude. The danger attending the application of the solutions of lead, mercury, and arsenic, to even superficial sores, is well known to every medical man; in an equal degree should the community be advised of the danger of these poisons when applied directly to the body, diffused in the foul atmosphere of an ill-ventilated house, in the wards of a crowded hospital, or between the densely peopled decks of a ship.

The following documents refer principally to the action of the solution of chloride of zinc on the effluvia or malaria from which dangerous and contagious diseases frequently arise, and also as regards its effects in correcting the offensive odor of all natural or morbid discharges from the living body, or such as pervade the wards of hospitals, the chambers of the sick in private life, or adhere to the necessary apparatus or utensils used in these.

Extracts from a Return to an Order of the Honorable the House of Commons, dated 19th July, 1847, for a Copy of Reports on Sir Wm. Burnett's Disinfecting Fluid.

Royal Naval Hospital, at Haslar, 12th July, 1847.

SIR:

In compliance with your directions to us to report on the use of Sir William Burnett's fluid as a disinfectant, or as to the removal of noxious smells, we have to inform you that it has been used in this hospital in the close stools of patients affected with dysentery, in the water-closets and cesspools, and also in the wards, when the air was tainted by purulent expectoration or discharge from sores, with the effect of immediately removing the disagreeable odors. It has also been used in the surgery with good effect, in removing the smell of putrifying animal substances, the odors of dead bodies under inspection, and when employed as a dressing to ulcers, it removes the disagreeable smell of purulent matter, and in proportion of one part of the clear solution to eighteen of water, it preserves subjects of natural history from putrefaction, and in a fit state for anatomical inspection, after more than a year has elapsed, or as long as our trials of it have lasted. We have had no contagious or epidemic diseases in the hospital, by which its powers of arresting infection might be tested; but it has been used, much diluted, for sponging the skin of patients affected by fever, with evident benefit, and the immediate removal of the odor of perspiration; and as it is itself inodorous, it is in no way offensive to the patients.

We have, &c.,

(Signed)

JOHN RICHARDSON, *Medical Inspector.*

J. ANDERSON, *Medical Inspector.*

JAMES ALLAN, *Deputy Inspector.*

ALEXANDER M'KECHNIE, M. D., *Surgeon.*

ALEXANDER STUART, *Assisting Surgeon.*

Captain Superintendent Sir W. E. Parry.

Royal Marine Infirmary, Woolwich, 2nd July, 1847.

SIR:

The solution of the chloride of zinc has been used in this hospital for a considerable time past. It has been employed both as a disinfecting agent, and to remove offensive odors. Of its powers in the former capacity, the opportunities which have offered here of testing them have not been such as to enable a decided opinion to be given; but of its utility as a destroyer of all kinds of offensive effluvia, there occur daily the most satisfactory proofs. Formerly the patient and others suffered annoyance from the use of the close-stool in the wards, notwithstanding the care which was then taken to prevent it; a disagreeable odor likewise clung to the water-closets, which were proof to constantly repeated ablutions; but since the chloride of zinc has been introduced into daily use, these inconveniences have entirely disappeared. Patients whose cases require it, may now be accommodated without discomfort either to those around them or to the medical attendants, and the water-closets are now enabled to be kept free of the slightest taint.

The great advantage which the chloride of zinc possesses over other agents employed for a like purpose, is, that it removes the disagreeable effluvia without leaving one little less offensive in its room, and may therefore be made use of wherever this effect is required,—in private as well as public buildings, in the sick bed-chamber no less than in the crowded ward. The method adopted at this hospital is to supply each of the wards with a bottle of the diluted solution, which the

nurses have directions to use whenever occasion may require, besides sprinkling it over the floors before the morning and evening visits are made.

I have, &c.,
(Signed) THOMAS NELSON,

Assistant Surgeon, Royal Marine Hospital.

Sir William Burnett, K. C. H., &c. &c. &c.

Letter to Sir William Burnett.

100 Great Portland street, August 24, 1847.

SIR:

I have much pleasure in bearing testimony to the efficacy of your solution of chloride of zinc, in purifying the air of sick chambers, to the great comfort both of the attendants and the patient.

In diseases attended with a foetid discharge, I have used the solution as a lotion with immediate and complete success. In the case of a child afflicted with perforation of the intestine, and from which a most offensive faecal discharge is constantly escaping at the umbilicus, the solution has proved of the greatest benefit; the smell formerly occasioned nausea, which he is now relieved from. Solutions of the chlorides of lime and soda corrected the evil, but they substituted an odor scarcely less disagreeable than the original one.

The solution has proved of the utmost service in a series of experiments I have been engaged in for some time. To prepare and preserve animal substances in a state fit to be brought to a consistency approaching petrification, a circumstance of paramount importance is, that no trace of putrescence should appear, otherwise disintegration of fibre and destruction of the objects are the certain effects. No preparation which I have tried (and I have used almost every metallic and earthy solution,) has proved so convenient and successful as the chloride of zinc; it neither changes color, form, nor texture. It also arrests putrefaction when it has already commenced. A mass of animal substance, into which the chloride has well penetrated, may be removed from the solution and dried in the open air, without the slightest fear of decomposition. This effect also is permanent, for if the substance be again wetted and kept in a damp place, still putrefaction does not commence. When its powers are more known, I am persuaded it will supersede every fluid used for preserving or disinfecting.

I have the honor to be, Sir, your obedient servant,
GEORGE WILSON.

Letter from Dr. Cronin.

Clarence Place, Cove, September 24th, 1847.

MY DEAR SIR:

A period of two months or nearly so having elapsed, since I ventured to express an opinion on the value of chloride of zinc as an adjuvant in the treatment of disease, or as a powerful means of rendering the air wholesome or pure in hospitals or the houses of the sick, by destroying bad smells, I think it desirable to inform you as to whether any change of that opinion then expressed may have, from extended observation, become necessary.

Anything occurring since has tended most strongly to confirm those opinions.

While fever remained unabated, another formidable and loathsome disease has sprung up, which in the numbers attacked, and its severity, surpasses any epidemic that has occurred in this country for half a century—I mean dysentery.

In every case of public and private practice, both for this disease and fever, the factor arising from the excretions, and the noxious smells generated in the air of the wards and rooms, the effect of the diluted solution of chloride of zinc has, in every case, been almost magical in its effects of removing those smells, and purifying the air.

Although I have not been able to come to any more decided conclusion as to its curative powers, in fever or dysentery, I must only allow you to deduce your own inferences from the fact that in our hospitals, since I last wrote to you, over 350 cases of fever have been treated, and only six deaths have occurred; while outside,

of over 400 cases of dysentery, not more than four deaths have occurred, two of those in very old people, and two infants.

I could not observe that the use of the chloride prevented the spread of disease, or checked its progress, though I do still think that it had and has some modifying influence on disease during its course. On the whole, it is a most valuable agent as a means of purifying the air of crowded and ill-ventilated rooms, &c.

I am, my dear Sir, most truly yours,

(Signed)

JOHN J. CRONIN, M. D.

Physician in Charge, Cove Fever Hospital, Infirmary and
General Dispensary, and Acting Surgeon to Artillery
and Ordnance in Cork Harbor.

W. Lindsay, Esq., M. D., Deputy Inspector of Naval Hospitals.

Notes by Dr. McWilliam, R. N., who attended the following experiment, which was made with the view of fairly testing the powers of the solution over the effluvia liberated from feculent matters.

January 26th, 1848, P. M.

Cesspool in Westminster-yard, (which from information from an official hand by, had not been opened for twenty years,) 6 feet long, 4 feet broad, and 7 feet deep.

The cesspool was brimfull, therefore the mass to be operated upon by the solution consisted of a cube of ordure = 168 feet, which was treated in the following manner:—

A quantity of paper, straw, and other fibrous matter, was raked up from the surface, with the effect of causing the mass to emit a most insufferable smell; I say insufferable, because the hydro-sulphate of ammonia, and other gases, were so abundantly evolved, as to drive us back from the privy door. Mr. Glass, at this time, directed the nozzle of a tube connected with a forcing pump, containing the solution, (diluted with 50 parts of water,) to the surface of the contents of the privy, and the power of the solution in destroying the gases was evident in a very few minutes, for all of us could enter the privy with little annoyance, while the smell in a coal-house next door was horrible, from the quantity of gas that had escaped before the chloride was applied. When a sufficient quantity of the solution had been poured in to fluidify and deodorize a stratum of ordure, say a foot deep, the nozzle of a hawse, perforated at the end with small holes, was plunged into the mass, and the fluid contents were drawn off by means of a double action pump; by continuing this process the cesspool was emptied.

On breaking ground, at every fresh stratum, the stench was most noisome; but it was instantly annihilated the moment the solution fairly penetrated the mass. After this, I need hardly say, that when the privy was emptied, it was perfectly free from smell.

The quantity of solution used was less than I had expected, eight quarts only being required; thus $8 \times 50 = 400$ quarts, or about 100 gallons to liquify, so as to be penetrable, a tolerably solid cube of 168 feet. On examining narrowly the matter operated upon, there was no ocular evidence of chemical action; a sulphuret of zinc must, I presume, be formed, but the precipitate is white, and is not discernible in the coloring matter of the animal substance.

There was not either, so far as any present could discover, any proof of the formation of a new gas, (as in many instances of chemical reaction) appreciable by smelling; the only change being a gradual and steady diminution of the offensive smell, until this was completely annihilated.

There were two other gentlemen present during about an hour; they went away quite satisfied with the experiment, even so soon as that (for the process occupied $2\frac{1}{2}$ hours, the liquified mass having to traverse about 180 feet of hawse before it was discharged into a drain outside.)

The following observations refer to the preceding experiment, which was also attended by the Very Reverend the Dean of Westminster;

From the "Daily News."

METROPOLITAN COMMISSION OF SEWERS.

A meeting of the Commissioners was held yesterday in one of the committee-

rooms in the New Houses of Parliament. Viscount Ebrington occupied the chair. Among the gentlemen present were Dr. Buckland, Mr. Broderip, Mr. E. Chadwick, Sir E. N. Buxton, Professor Owen, and Mr. Leslie.

* * * * *

Dr. Buckland observed, with reference to the deodorizing fluid, that he had made various experiments with the inventions of Sir W. Burnett and the other gentlemen. He had commenced with that of Sir W. Burnett, and the result was perfect. He had ascertained that to annihilate the odor in four cubic yards of fluid, it would require ten quarts of the deodorizing fluid, and the time occupied in the process would be two hours. He had, however, no doubt that, when the operations were conducted more upon system, they would be able to do twice as much work in a day as at present. He begged to put in a written statement of his experiments.

PART III.

PRESERVATION OF ANIMAL SUBSTANCES.

Not the least singular and useful of the properties belonging to the chloride of zinc solution is that of preventing or arresting the process of putrefaction in dead animal substances; for this purpose, together with its "antibromic" powers, it has been recently used with marked benefit in several of the London anatomical schools, and by private individuals in performing laborious dissections of the inferior animals. It has also proved a singularly useful menstruum for preserving specimens of morbid anatomy. As a proof of its having these properties it is presumed the following documents will be deemed satisfactory; if they are not, the production of any others tending to establish the same facts, would as a matter of course be equally unavailing:—

14 Golden square, February 13th, 1846.

MY DEAR SIR:

It affords me much pleasure to state the result of some experiments I have made with your patent fluid, with the view of testing its value as a preservative of animal structures prepared by the anatomist. This will not require many words. When used in a proper degree of dilution (about one part to fifty of water) *its success is complete*, and it appears to me to *preserve the color and texture of the parts very admirably*. *It has the further very important advantage of not acting on the steel instruments employed*, being in this respect equal to alcohol. I consider this fluid as a very valuable addition to the means hitherto at our command for such objects.

Believe me, my dear Sir, ever faithfully yours,

(Signed) W. BOWMAN, F.R.S.,

*Demonstrator of Anatomy in King's College and Assistant
Surgeon of the King's College Hospital.*

Sir William Burnett, K.C.H., &c. &c.

14 Golden square, March 8, 1847.

MY DEAR SIR WILLIAM:

Since I last reported to you the result of the application of your fluid to the purpose of preserving anatomical specimens, I have had more extended experience of its employment in the same way. We have injected with it the subjects dissected at King's College, under the provisions of the Anatomy Act, during the last six months, and I have great pleasure in assuring you that I regard it as a very valuable material. The different animal textures admit of being perfectly preserved from putrefaction under its judicious employment, and I need not say that it has enabled us to keep the apartments where dissection is carried on, in a more salubrious and wholesome condition than heretofore. When we consider how extremely important

it is to the whole community that the fullest means should be afforded to medical students to master the details of human anatomy, and thus to lay the foundation for a substantial and sound knowledge of medicine and surgery, the discovery of a fluid which will remove the greatest impediment to dissection, and render its prosecution not unhealthy, must certainly be regarded as a public boon,—and the liberality which you have shown in giving us abundant supplies of your preparation, for the purpose above mentioned, deserves our warmest acknowledgments.

(Signed) W. BOWMAN,

Sir W. Burnett, K.C.H.

Demonstrator of Anatomy, &c.

From Professor Sharpey.

University College, London, 29th October, 1845.

MY DEAR SIR WILLIAM:

I gladly state the result of the trials I have hitherto made of the chloride of zinc, as a preservative of the dead body for anatomical purposes. * * *

The liquor not only prevents the access of putrefaction, but corrects its effects, and arrests its further progress when employed after the process has commenced. I witnessed a most singular instance of its efficacy in correcting offensive putrescence, and checking further decomposition, during the warm and moist weather of July, and can speak most confidently on the point.

We are now trying the qualities of the solution as a liquid for preserving wet preparations in jars, for which purpose I think it ought to answer well. I shall let you know the result of our trials when sufficiently advanced.

I remain, my dear Sir William, yours faithfully,

(Signed) W. SHARPEY.

To Sir William Burnett, K. C. H., &c. &c.

University College, London, 10th March, 1847.

MY DEAR SIR WILLIAM:

Further trials, and eighteen months' further experience of the use of your antiseptic liquor, have only served to confirm my conviction of its decided efficacy in checking the putrefaction of animal substances, in permanently preserving from decay portions of the animal body immersed in it, and in correcting offensive smells arising from putrescent animal matter.

Yours, very faithfully,

(Signed) W. SHARPEY.

Sir W. Burnett.

12 Cecil street, Strand, May 18th, 1847.

SIR WILLIAM:

Having observed, in a printed testimonial of Professor Sharpey, a reference to a signal instance of the efficacy of your patent antiseptic solution in correcting offensive putrescence, I have much pleasure in being able to afford you a correct account of the matter, being myself the individual who dissected the putrid body alluded to. The season was the month of July, and the weather warm and moist. The body was much swollen from putrefaction, and the abdomen of a deep green color, while the stench was so overpowering that, on opening the cavity of the chest, for the purpose of injecting the arteries, the dissecting-room porter was so overpowered as to be obliged for a time to quit the body, while my own stomach became quite sick. On this being made known to Professor Sharpey, he considered it an excellent case for testing the effect of your solution, and accordingly ordered the vessels to be injected with a weakened portion. The effect was marvellous, as in less than ten minutes all trace of bad odor had disappeared. I was enabled to dissect and perform all the operations with the greatest comfort, and a portion of one extremity was permitted to lie for many weeks on the dissecting-table, exposed to the atmosphere, without undergoing much visible change. In fact, I fully concur with Dr. Sharpey, that it is one of the greatest boons conferred upon the profession. I am also inclined to think that it will be the means of sav-

ing many valuable lives, which are annually lost by wounds received in the course of dissection: for while in the course of dissecting the above subject, I cut myself several times, and once received a punctured wound, without the least bad consequences arising,—a circumstance, considering the extreme putrescency, I could not have deemed possible, had not your solution previously destroyed the effects of the putrid virus.

I have the honor to remain, Sir William,

Your obedient servant,

(Signed)

WILLIAM L. METHVEN.

To Sir William Burnett, M. D., K. C. H., &c. &c.

From W. V. Pettigrew, Esq., Lecturer upon Anatomy and Physiology, St. George's School of Anatomy and Medicine.

30 Chester street, March 24th, 1846.

DEAR SIR WILLIAM:

I have now used extensively your preparation for the preservation of animal matter, and I find that it succeeds most completely.

From the 3rd to the 28th February, I lectured upon the superior extremity.

The arm when received was green in color, and highly offensive.

I injected the arteries with the fluid, mixed in the proportion of one pound of chloride of zinc to three gallons of water; and as the dissection proceeded, the surface of the limb was sponged about every alternate day with the solution. It was perfectly restored to its former fresh condition. I have also placed various portions of the body in the solution, and they at present remain quite free from putrefaction.

All our subjects are now injected with the fluid immediately they arrive, and I do not hesitate to say that our dissecting-room is more free from unpleasant odor than any room of the kind in the metropolis; and the great advantage this fluid possesses over all others we have as yet tried is, that it has no effect upon the knives.

I cannot but consider it one of the greatest boons conferred upon the profession. Dissections may be carried on in the hottest weather, without the slightest injury to the health, or offence from smell.

Believe me, dear Sir William,

Yours very faithfully,

(Signed)

W. VESALIUS PETTIGREW.

Sir W. Burnett, K. C. H., F. R. S., &c. &c.

From R. Partridge, Esq.

MY DEAR SIR:

17 New street, Spring-gardens, 9th March, 1847.

I have now given a careful and extended trial to the use of your antiseptic, in the preservation of animal bodies, and I can fully corroborate the opinion which others have given of its utility. No body is now dissected at King's College, which has not been previously prepared by injecting your antiseptic into the arteries; and this preliminary proceeding is *not found to interfere* with the subsequent success of the ordinary *paint-injection*, which should be thrown in on the *following day*. As the parts become exposed in the progress of dissection, it is useful to moisten them with a little of the solution by means of a soft sponge, and the hollow viscera should be *washed out* with the solution by the aid of a syringe.

By these measures, the different structures of the body are fully and distinctly preserved; the muscles, however, become paler, and perhaps a little more fragile than natural, but remain quite distinct.

A great advantage of this solution over ordinary antiseptics is, that it does *not blunt the knives* employed in their dissections.

It only now remains for me to try the fluid in the preservation of the brain, and as a substitute for spirits in museum preparations.

The best proportion for the preservation of fleshy parts is, *one part of the solution*

to ten parts of water. For membranous structures, one part of the solution to fifty parts of water are sufficient.

Sir William Burnett. I remain, dear Sir, faithfully yours,
(Signed) RICHARD PARTRIDGE.

Extract from the Journal of Mr. James M'Bain, Surgeon of H. M. surveying vessel "Mastiff," between 21st February and 26th December, 1846.

I beg leave to add my testimony to the rapid and perfect effects of the chloride of zinc solution upon animal matter in a state of putrefaction. Having frequent opportunities of dissecting, or examining large fish, &c., cast on shore, whilst undergoing decomposition, the task has been occasionally anything but agreeable, for want of a convenient power to destroy the putrefactive process. I have simply to say, that the chloride, in these cases, acts like magic; and as a great practical agent over one of the most important conditions of animal and vegetable matter, viz., putrefaction, it stands unrivalled.

From Sir James Murray.

Anatomy Office, Merrion-square, Dublin, March, 1847.

MY DEAR SIR WILLIAM:

Much as medical men are indebted to you for advancing their professional improvement and comfort at sea, we all owe you even more gratitude, for promoting the practice of anatomy, and securing the health of its students on land.

Your *preserving liquor* has been used in several anatomical schools, under my inspection, in Ireland; and I am happy to state, it answered every purpose which its chemical properties led us to expect.

The chloride of zinc, when judiciously diluted, preserves the animal texture without rendering it hard or injurious to the knife. The long preservation of subjects give students plenty of time to dissect slowly and minutely, and deliberately to fix in their minds the relative positions of all parts of the body. Formerly dissection was a race against the rapid progress of putrescence; this is by your invention avoided. During fifteen years as Inspector of Anatomy, I have known many youths deterred from dissection by the disgusting factor of dead bodies, whilst several students suffered severely from inhaling the odious vapors of cadaverous dissecting-rooms. But those where your liquor is used are as free from smell as an ordinary school or college; and thus dissection is exempt from the distaste and danger with which rapid decomposition invested the practice of anatomy, by the study of which only can medical men hope to reach perfection in the healing art.

I trust soon to see all the sick wards of hospitals "sweetened" by your disinfecting chloride of zinc.

I remain, my dear Sir William, yours very truly,
(Signed) JAMES MURRAY, M. D.,
Inspector of Anatomy, Dublin.

Sir William Burnett, M. D., K. C. H.

From Professor Hargrave, to Dr. R. Graham.

DEAR SIR:

York Street, December 14, 1847.

In reference to the conversation we had a few days since, as to the value of the "chloride of zinc" as a disinfecting agent against miasmata, I feel pleasure in complying with your request to state my experience of it.

For the last two sessions that I held the professorship of practical and descriptive anatomy in the school of the Royal College of Surgeons, I was in the daily habit of sponging the portions of the subject for my lecture with a solution of it, drachmam ad libram aq. distillatæ, and was more than pleased to find that all effluvia was destroyed, I may say annihilated; after lecture, I always sponged my hands with a fresh portion of the solution, and had the gratification to find that no odor whatever was left on them; so that I could examine the mouth and nose of the most sensitive patient, without any risk of betraying what my previous occupation had been.

In the use of it, the instruments, however finely edged, did not seem to be in any way blunted, nor did any unpleasant sensation remain on the hands after it; which

has always attended the use of any other disinfecting agent of the saline class that I ever availed myself of.

I have recommended its use to my pupils before commencing post-mortem examinations of those dying of peritonitis, whether of the puerperal form, or from any other cause.

I may also mention to you that in my practice in the City of Dublin Hospital, in the past autumn, I had a male patient (Ryder) suffering from extensive cutaneous cancer of the perinæum, which emitted an intolerable fætor; the chloride was prescribed as a lotion, "granum ad uncium aq. dist," which did not only remove the odor, but acted for four or five days as a *perfect calmative to his sufferings*.

I remain, dear Sir, faithfully yours,

(Signed) WM. HARGRAVE,

Professor of Surgery, Royal College of Surgeons, Ireland.

APPENDIX.

SPECIFICATION

Of the Patent granted to Sir William Burnett, Knight, Commander of the Royal Hanoverian Guelphic Order, of Somerset Place, Strand, in the County of Middlesex, for Destroying the Tendency of certain Vegetable and Animal Substances to Decay. Sealed July 26, 1838.

To all to whom these presents shall come, &c. &c. Now know ye, that in compliance with the said proviso, I, the said William Burnett, do hereby declare that the nature of my said invention and the manner in which the same is to be carried into effect, are fully described and ascertained in and by the following description thereof, (that is to say) :—

The invention consists in destroying the tendency of certain vegetable and animal substances to decay, by submitting them to the action of Chloride of Zinc. In preparing wood, canvas, cordage, sail-cloth, hemp, flax, wool, and other vegetable and animal matter, or articles made thereof, a tank, or other vessel of wood or other suitable material, is provided. This is to be filled about two-thirds full of chloride of zinc, dissolved in cold water, in the proportion of one pound of chloride of zinc to five gallons of water; this is allowed to remain for ten or twelve hours, when the Solution will be ready. The material which is to be prepared is then placed in the Solution, keeping it completely covered by the liquid. If wood or timber is to be prepared, it is to remain in the Solution from 10 to 21 days, according to its size and thickness; that is to say, if the timber be of the thickness of from 8 to 13 inches and upwards, it is to be immersed in the Solution for 21 days; if from 4 to 8 inches thick, for 14 days; and if less than 4 inches thick, for 10 days. When the wood or timber has been so immersed, it is to be taken out and placed in a situation sheltered from the weather, until it becomes perfectly dry. In preparing canvas and cloth of hemp or wool, they are to be kept in the Solution for 48 hours, and then dried under cover; and in this manner, other vegetable and animal materials of thin texture may be prepared. In the preparation of rope or cordage above the thickness of 2 inches, steep the hemp or yarns of which the same is to be formed, in the Solution, for 48 hours, and all rope or cordage of 2 inches or less, is to be steeped in the Solution for 72 hours. In all cases, where tar is employed, the yarns forming the cordage should be placed in the Solution for 48 hours, and allowed to dry before undergoing the tarring process. In ship building, and in building or repairing houses, besides preparing the timber to be used therein as above described, it is desirable to use a paint, made by grinding impure oxide of zinc (lapis-calaminaris) with oil or other suitable vehicle. This paint is recommended to be applied at the time the materials are brought into contact, to the faying parts of all scarfs, and on the joists and faying parts, wherever else two pieces of timber are brought into contact, and also on the under sides of the flats of all magazine-platforms, and all other platforms below the orlops of Ships of the Line, and lower decks of Frigates, and below the upper decks of Sloops and smaller vessels. In houses, the paint, made as before stated, is to be used for the inside of skirting and wainscoting of ground floors, and upon every part of the timber materials below the external surface of ground floors.

In witness whereof, &c.

Enrolled January 21, 1839.

SANITARY PURPOSES AND METHOD OF APPLICATION.

Objects.	Mode of applying the Fluid.	Proportion of Mixture.	
		Fluid.	Water.
To purify Sick Rooms and the Wards of Hospitals, Workhouses, Prisons, Factories, and Crowded Places, the between-decks of Ships, &c.	Moisten, with the diluted solution, a piece of flannel cloth, attached to a long rod, and wave it through the air of the apartment for ten minutes at a time; in addition to which, the floor should be mopped or sprinkled over with the same, if necessary, several times a day, and a small quantity of the same dilute solution should be put into the close-stools and bed-pans. The water-closets should also be cleansed with it, and a couple of gallons occasionally thrown down each.		1 to 40
	N. B. For use on board ships, between decks, and in places where, from imperfect means of ventilation, it may be inconvenient to wet the floors.—Moisten with the diluted solution thick pieces of flannel cloth—the thicker the better—and wave them through the air of the apartments for ten minutes, and then suspend them in the most convenient manner to the deck-beams, or across the rooms, and keep other similar pieces of cloth thoroughly and repeatedly saturated with the same solution, in flat dishes upon the floors. It is essentially necessary that the bilge-water in the hold of the vessel should be purified agreeably to the instructions given below.		
To purify Fever Wards, in cases of death.	When a patient dies of fever, the body should be sponged over with the dilute solution, and the clothes and bedding should be immersed and kept in a sufficient quantity of it, for forty-eight hours, before being washed. The floor should be well mopped over with the solution. Flannel moistened with it (as before recommended,) should be waved through the room.		1 to 40
To purify the Clothes, Linen, &c., of sick persons.	Immerse the articles in the dilute solution, as directed in sick rooms.		1 to 40
To prevent the communication of Infectious Disease.	Sprinkle the dilute solution over the whole of the floor of the apartment, and very slightly on the coverlid of the patient's bed. The clothes used should be immersed in the solution, and afterwards thoroughly dried. Moisten pieces of flannel cloth, and use them as directed above.		1 to 40
To purify the odor of Night-chairs.	Put half a pint of the dilute solution into the pan previous to its use, and when emptied, rinse it out with a small quantity.		1 to 40
To disinfect dead bodies, and purify apartments preparatory to the visits of Searchers, Undertakers, and Jurymen, and in cases of Post-mortem Examination.	Wash the body occasionally with the dilute solution, which will remove all unpleasant smell, and retard putrefaction.		1 to 40
To prepare, and arrest the decomposition of Subjects for Dissection.	Immerse the subject in the dilute solution, and let it remain about two hours; after which time it will be purified. As the dissection proceeds, the parts should be sponged over with the same; and, if they are to be preserved, the blood-vessels should also be injected with the solution.		1 to 40
To disinfect Cesspools, Drains, Water-closets, &c.	Pour in a quantity of the solution in proportion to the capacity of the receptacle. For ordinary water-closets, one gallon of the dilute solution will generally be effectual. For large cesspools the quantity must be increased in proportion to their contents.		1 to 20
To purify Larders and Stables.	Sprinkle the floor, and wash all the wood-work with the dilute solution.		1 to 20
To sweeten Musty Casks, Tubs, &c.	Rinse them well with the dilute solution.		1 to 20
To destroy Canker and Fungus in Trees.	Apply the solution carefully with a brush, to the parts affected only.		1 to 40
To extirpate Bugs and other Vermin.	Wash the floors and all the crevices with the dilute solution. The joints, &c., of the bedsteads should be moistened by a brush with a solution consisting of one part of fluid to five parts of water.		1 to 20
To purify Bilge-water, and the Holds of Ships.	The quantity to be used at a time is twenty gallons of the dilute solution for each hundred tons of the ship's measurement. It should be poured into the air holes of the ship, so that it may find its way by the limber-holes into the well; and it should be thrown by a small engine into places where it may be inconvenient to introduce it by other means. A portion may also be poured down the ship's pumps, the boxes being previously removed to allow of its free passage below. The solution should be allowed to remain in the ship twenty-four hours. At the expiration of that time, the ship should be pumped as dry as possible, the well thoroughly cleansed and washed with the solution, and the operation repeated as occasion may require.		1 to 20

N. B.—When floors and other wood-work are washed with the Solution, it should not only be freely applied, but well rubbed into all parts of the wood; and the use of soap or soda should be avoided immediately before or after its application.

This preparation, supplied in quart bottles for the purpose of disinfection, is not to be used for the preservation of Timber, Canvas, or other materials, without a License, as for that purpose it can only be obtained direct from the manufactory of the Patentees, and used under their License; respecting which, information and full particulars may be obtained at the office, 53 King William Street, London.

DESCRIPTION OF THE BURNETTIZING APPARATUS

Erecting by the Proprietors of Locks and Canals on Merrimac River, for the use of the Manufacturing Companies at Lowell.

The most important feature of this apparatus is the Tank. This is a cylindrical vessel of cast iron, sixty feet long and five feet in diameter. It is composed of twelve rings, five feet long each, strongly bolted together. The iron is one inch thick, and is intended to resist a working pressure of one hundred pounds to the square inch. The ends are closed with cast iron heads, one of which is movable for the purpose of loading and unloading the Tank. Parallel to this Tank is placed a wooden cistern fifty feet long, six feet wide, and four feet deep; the top of the cistern is a little below the bottom of the Tank, so that the liquor may run freely from the Tank into the cistern, on the opening of a cock.

The operation of the apparatus is intended to be as follows:—The Tank being filled with timber, and the head packed tight, the cock in the pipe leading from the Tank to the cistern is closed, an air pump one foot in diameter, and three feet stroke, is then put in operation by the action of a small steam engine, and the air in the Tank exhausted to the required extent, which will be indicated by a Barometer Guage. It may be found desirable to continue the action of the air pump for some time after the Barometer Guage indicates the desired vacuum, as it is most probable air will continue to pass out of the pores of the wood for some time.

The next operation is to open the cock in the pipe leading from the tank to the cistern. It will be readily seen that the interior of the tank being nearly a vacuum, that the liquor in the cistern will be forced into the tank by the atmospheric pressure; in order to completely fill the tank, however, it is intended to keep the air pump going until the tank is filled with liquor; this will be indicated by the appearance of the liquor at the air pump. The moment this happens, the air pump will be stopped, and soon after the cock in the pipe leading from the tank to the cistern will be closed. A forcing pump of four inches in diameter, and two feet stroke, will then be put in operation to pump liquor from the cistern into the tank. This will be continued as rapidly as the absorption of the liquor by the wood will allow, and until the escape at the safety valve is such as to indicate that the wood is completely saturated. It is intended to load this valve to the pressure of one hundred pounds to the square inch.

When the wood is completely saturated, the safety valve will be lifted up, so as to give free admission to the air; the cock in the pipe leading to the cistern opened, when the liquor will flow back into the cistern. Nothing then remains except to unpack the head and take out the timber.

To facilitate the loading and unloading of the tank as much as possible, a railway about two feet wide is laid on the inside of the tank, and extended outside the tank far enough to receive a car sixty feet long, and about three and a half feet wide, running on nineteen pairs of wheels, six inches in diameter. This car will be drawn in and out by a windlass.

The chloride of zinc is purchased of the manufacturing chemists in the form of a strong solution, containing about 55 per cent. by weight of dry chloride. This solution will be put into the cistern and reduced to the strength required.



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